

# SCIENCE DIGEST

A man with dark hair, wearing a light blue dress shirt and a patterned tie, is looking directly at the camera with a serious expression. Several playing cards are floating around him, including a King of Hearts, a 7 of Clubs, and a Queen of Spades. The background is a warm, yellowish-brown color.

APRIL 1968 • 50 CENTS ICD

## THE GAMBLING ADDICT

—why he can't quit

LSD and broken  
chromosomes—  
what they mean  
for your  
children

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STEVE ALLEN:  
Let's brainwash  
our criminals

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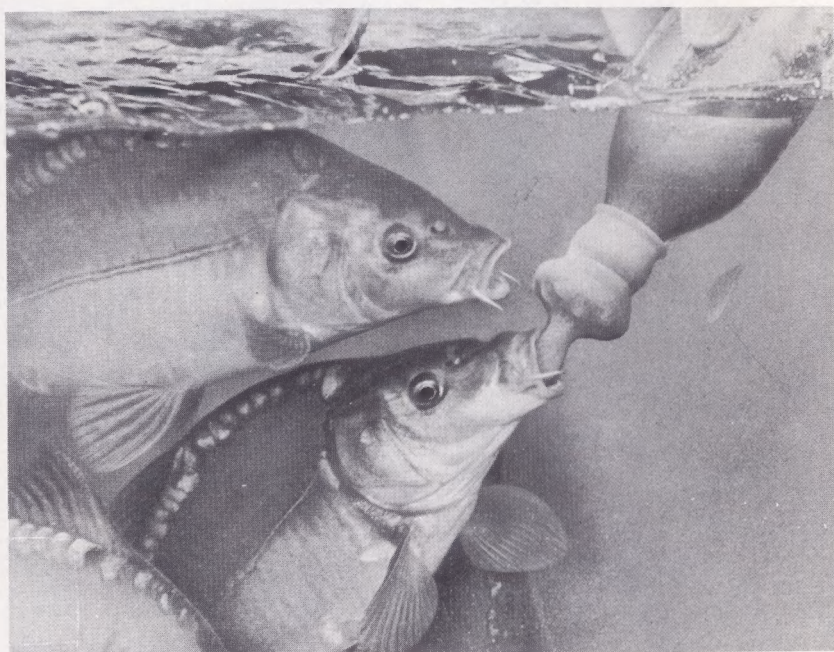
ISAAC ASIMOV:  
What's wrong  
with Pluto?

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An MD prescribes  
for emphysema

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but are they morally right or legal?



Pictorial Parade

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**B**OTTLE feeding or the natural way — which makes for stronger, bigger, tastier carp? The bottle wins, according to a German biologist and a German zoologist. The scientists began conducting tests to answer this puzzling question several years ago at the Max Planck Institute for Synthetic Plant Foods Development in Germany. They successfully raised young carp in transparent plastic aquariums, feeding them synthesized food with a baby bottle every two hours. Their result was carp which were “meatier” than those

previously studied under natural conditions. They also found that the carp raised in controlled-temperature water of between 20 and 30 degrees; grew, in 18 months, to the size it had previously taken three years to reach. The first fish studied went from 130 grams to 7,000 grams in the year and a half.

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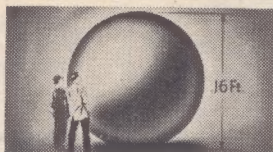
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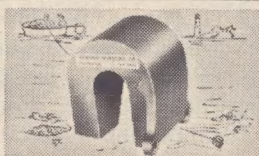


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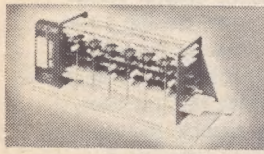
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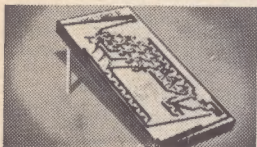
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**F**ASCINATING things are going on today in psychology. During the month, we attended a briefing on "Social and Behavioral Sciences" sponsored by the Council for the Advancement of Science Writing and the Russell Sage Foundation at Rutgers Univ., N.J.

Dr. Omar Khayyam (no fooling) Moore, University of Pittsburgh, demonstrated with movies his "talking typewriter," on which children aged *three* learn to read and write.

## THIS MONTH

The machine tells them what to type and they type it. Movies are played back for them and the kids edit the film. "It lets the child see how he looks to himself (he edits out embarrassments). Then we edit it, and he sees how he looks to others," says Moore. One of his proteges, now a brilliant 12, was on hand. At three she could spell four-syllable words!

Dr. B. F. Skinner of Harvard also was present, to discuss "environmental reinforcement" as opposed to "rewards and punishments" in behavioral systems. In experiments conducted in a school for delinquent boys, the lads were given opportunities to earn freedom to go out, to earn points for better food, etc. It worked, and many later left to earn an honest living.

What Dr. Skinner had to say bears out the same points Steve Allen has made in his startling proposals for the rehabilitation of criminals on page 34.

—RFD

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# DIGEST®

A man can be as "hooked" on gambling as on alcohol or narcotics. The outcome is often the same—a ruined life. A report on the tortured inner world of the gambling addict, and a possible way out, begins on page 7.

photo by Robert Berger



APRIL • 1968

Vol. 63, No. 4

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### *Bulletins at press time*

LIGHTS TO THE MOON. The Surveyor 7 spacecraft on the moon has been able to photograph two laser beams from the dark side of the earth. The lights were flashed from two mountaintops in the western United States. The test was considered vital for the future use of lasers in communications and space measurements.

PRIMITIVE CHLOROPHYLL. Scientists Cyril Ponnamperuma and Gordon Hodgson believe they are on the track of discovering how chlorophyll was created in the primitive atmosphere of earth 4.5 billion years ago. The creation of most other compounds necessary for life has already been accomplished in the laboratory under conditions simulating those of a young earth. (See *Man the Creator*, March '68).



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PROBING THE PYRAMIDS. After a delay caused by complications resulting from last summer's Middle East war the project to "X-ray" the pyramids with cosmic rays is under way. It is hoped that the joint U.S.-Egyptian study will succeed in locating the suspected secret burial chamber within the Khefren pyramid at Giza. Such chambers have been located in the other two great Giza pyramids.

INFECTED FISH PERIL. Scientists have found that fish exposed to dangerous germs from man contained in polluted waters, can transmit the germs back to man and thus become a public health problem. Biologists noted evidence of such infections in white perch caught in rivers that flow into Chesapeake Bay through heavily populated areas.

MOUNTAINS OF VENUS. Using the world's largest radio-radar telescope, astronomers have been able to map one third of the cloud-covered planet Venus. The radar observations have pinpointed rough areas near the planet's equator and a prominent feature in the southern hemisphere that may be a steep mountain range.

END OF TOOTH DECAY? Scientists at the National Institute of Dental Research have located an enzyme that prevents the formation of dental plaque in animals. Plaque is believed to be a precursor of tooth decay. The Journal of the American Dental Association commented that the experimental results "may well be a major breakthrough in the control of dental caries."

RETURN OF THE HUDSON STURGEON. The giant Hudson River sturgeon, virtually extinct for half a century seems to be staging a comeback. The fish, which reaches over seven and one half feet, and may be the world's largest freshwater fish, was once commercially important as a source of meat and caviar.





PIX

## The psychodynamics of gambling

by Barbara O'Connell  
with Melvin Herman  
and Flora Rheta Schreiber

**S**AM made \$125 a week as the traffic manager for a manufacturing concern, and he owed \$100 of it. Every week he'd borrow from one creditor to pay the other. At fi-

nance companies, he renewed loans time after time so he wouldn't have to pay them off. One day he totaled up his debts—\$3,600. Not a big sum, perhaps, but an impossible one for him to raise. Depressed, he put down the pencil he'd used to add up the figures. He reached for

the telephone. "Hello? This is Sam. I want to make a bet on. . . ." When he hung up, he was almost happy. This time, he might win.

Sam is a compulsive gambler. For 25 years—he's now in his 40s—he has bet on horses, athletic contests, cards, pool—whatever's available. For Sam, the gambling season is always on. Now he's in debt, his wife is sick, and his children need clothes for school. But for the moment, Sam is content. He paces up and down the room and looks at the telephone. He might win. He will win. He's lucky.

### **Six million compulsive gamblers**

It's estimated that there are six million compulsive gamblers in this country who throw away twenty billion dollars a year. Gamblers Anonymous (GA), a 10-year-old organization that helps gamblers kick the habit, still has fewer members than Alcoholics Anonymous, but it's opening new chapters every year. Gambling fever attacks a cross section of the population. Some gamblers are rich; others comparatively poor. Sam makes a small salary and wagers small amounts. High salaried executives roll up debts in the hundreds of thousands of dollars. But all compulsive gamblers share a common failing that differentiates them from those who gamble for fun: they must lose. They never quit while they're ahead.

What makes compulsive gamblers act like this? The psychiatric

literature on the subject is limited. In all, there are only about 20 books and scientific papers on gambling. But most of the 20 psychiatrists who have published studies think compulsive gambling stems from unresolved problems in the man's life. Many of these problems, they believe, are carried over from childhood in the form of conflicts with parents or other family members.

In particular, psychiatrists say that the gambler has a deep-seated feeling of guilt. He wants to punish himself. If he wins for a while, it's never enough. So he wagers more. If he loses, he's depressed. Although they seem cheerful enough on the surface, gamblers actually live on the brink of a depression intensified by the loss of their self-esteem.

"Compulsive gamblers gamble in an attempt to ward off an impending depression," says Dr. Ralph R. Greensen of Beverly Hills. As a result, plush gambling places, the meccas of escape and indulgence, are usually the meeting ground of depressed people. In novels, gambling centers like these often figure in suicides. Facts live up to fiction in this case. Threatened by debts, family troubles and even jail, desperate gamblers do commit suicide.

Members of GA who man a 24-hour-a-day phone service report a number of suicide threats. "I've got one foot out the window," a caller told a member recently. "Hold it," the member advised calmly. "Come to the meeting and



*Gamblers live in fantasy world—where only good can happen, and Lady Luck is on their side.*

I'll go to your creditors with you. You won't have to go to jail." The caller appeared at a meeting that night.

The gambler battles with fantasy as well as guilt. Dr. Edward E. Harkavy of New York City says that even his patients who have been cured of compulsive gambling cling to fantasies that are accompanied by physical excitation. As long as the meaning of his fantasies remains fantasies, below the level of consciousness, he is unable to attain relief or satisfaction.

One of the ways in which the gambler retreats into fantasy is by play, which is associated with children. And, childlike, they think only good things can happen to them. Most compulsive gamblers cling to this belief even when it's repeatedly proven false.

Another fantastic aspect of the gambler's thinking is his belief in Fate and Luck. He equates Fate with God and the omnipotent father of his early childhood. Luck is a lady who is both mother and saint. Fate is all-powerful, but Luck has a loving side that expresses itself in protectiveness. The compulsive gambler is out to woo Luck, conquer Fate and defeat not only his opponent, but also logic and even the "establishment." All this is riding on a throw—he's not playing just for money.

Oddly enough, the gambler may

actually be driven by a high unconscious purpose—the search for meaning. Life is a gamble in its unpredictability, he feels. Gambling is like facing the unknown twists of fate which lie ahead. It's an attempt to impose order and control on a capricious and unfeeling universe. Fate is forced to obey his wishes and discharge its bounty.

All compulsive gamblers show the same faulty thinking—the family man as well as the loner, the woman as well as the man, the well-heeled as well as the down-and-out. "I had the illusion I was smarter than anyone else," says Henry P., a reformed gambler who almost ruined his prosperous dress manufacturing concern before he gave up gambling.

**"Not a day out of debt"**

Henry's case history is revealing. Betting on horses became his "first love" at 15, but he was always eager to gamble at gin rummy, poker or dice. "I don't remember a day I was out of debt," he says. When he got out of the army in 1945 with a little nest egg, he gambled it away. Soon a high weekly salary was going the same route. He began stealing from his brother and from his employer. In 1950, he went into the dress business. Intelligent and energetic, he built up a three and one-half million-dollar

business—and gambled it away. By 1960, he was bankrupt.

"But the thing that gambling really affects is family unity," he says. "My wife didn't stand a chance. I wished her dead. Once I threw her bodily out of the car because she tried to stop me from gambling. She even developed a bleeding ulcer. But I didn't consider myself a real bastard — I didn't want to feel 'no good.'"

### **Innocent beginning**

Like Henry, most gamblers begin gambling casually enough. He visits the race track with a friend. Perhaps he wins a large stake on his first trip and comes away with a euphoric feeling. Luck will be eternally his. He is just lucky. Besides, it's exciting. Once hooked, he can't keep from blowing the family savings, cadging loans from his friends and getting into debt with loan companies. He may even go to jail. Gamblers Anonymous has three chapters in jails, the membership composed of convicts who've landed there through activities connected with gambling.

More and more gamblers are turning to Gamblers Anonymous for help. It's an organization of compulsive gamblers who are working together to beat the habit or who already have months or years of a life of non-gambling under their belts. There are 85 chapters in the United States, 15 chapters in Europe and several more in Canada. Started in California about 10

years ago by an ex-gambler, Gamblers Anonymous works by demonstration of fellowship. In GA, the compulsive gambler learns he doesn't stand alone.

"I didn't think I could possibly stop gambling but when I heard someone at a Gamblers Anonymous meeting say he stopped, that showed me," says Henry, who hasn't gambled for the last five years. "It wasn't bigger than I was."

Members of Gamblers Anonymous liken their approach to group therapy. In fact, they say when a man comes before the group to talk about his problem, he's "doing his therapy." The start is attending a meeting and hearing men at work on their therapy.

One such meeting takes place every week in a building in lower Manhattan. On a recent evening, 20 men—an average number for a GA meeting—sat around a table. There were no women. GA has women members, but they're a tiny minority of the membership. A chairman introduced one of the men, John, by his first name. No last names are used. John, a husky man in his 30s, stands up. "I'm John and I'm a compulsive gambler. I've been in Gamblers Anonymous for five years and I haven't placed a bet in that time. Before that . . ."

The story he told is typical of those in Gamblers Anonymous: the early introduction to gambling, the quick development of the passion, the bouncing checks, the lost business, the faltering marriage. Most



*Gamblers Anonymous, like AA, share their troubles, hoping to convince the addict he can lick his habit.*

typical, perhaps, was John's obsession with gambling. "It was the last thing I thought about before going to sleep and the first thing I thought about when I woke up," he says. "I spent 90 percent of my time thinking about it."

The chairman introduces each man in turn and each relates his tale. They speak in firm, clear voices with a lawyer-like grasp of timing and gesture. "We couldn't talk to groups before," one explains later. "We were all loners. But we've been telling the same story in GA for years, so we're pretty good." The stories vary in details each week, however.

### **Wives seek advice**

In another room in the building, a group called Gam-Anon was meeting at the same time. Composed of relatives of gamblers, Gam-Anon draws mostly wives, both those who have husbands in GA and those whose husbands are still gambling. On this particular evening, all 15 participants were wives. A young and attractive redhead asked for advice about her husband, who refuses to admit he's a compulsive gambler. The women offered suggestions based on experience and Gam-Anon literature.

"Put your money in your own checking account."

"Don't cover his checks — let

them bounce. Just get the money you need for household expenses."

"Remember, he can't help it—he's sick."

There's a lot of laughter, some of it bitter. "I feel like killing myself," the redhead cries at one point. "Don't kill yourself, kill *him*," responds an older woman, laughing. "You haven't done anything wrong." The groups laughs too, but the newcomer seems on the point of tears. "We get so we can laugh about it, but we're all crying when we come in," one of the women remarks later.

The ring of truth comes through in these sessions. Unlike the psychiatrist, these men and women speak from personal experience. They've lived through it.

The keynote of the Gamblers Anonymous program is abstention. Like alcoholics, gamblers who indulge their weakness can't stop. They must give up gambling completely. The prescribed way is to take one day at a time. Members are advised to tell themselves: "I didn't gamble today, I won't gamble tomorrow." Some do it the hard way, however. After his first meeting, Henry told himself: "I'll never gamble again." It worked. He cancelled a bet he had on the Kentucky Derby and never made another wager.

The Gamblers Anonymous program has other aspects. After a few

meetings a new member and his wife get together with a panel of experienced members for advice on their financial situation. "They tell you how to pay up," explains Sam, who joined GA after his debts hit \$3,600. "After two years in GA, I only owe \$700. They want you to pay off slowly—otherwise you

might get cocky." Sam, too, is now an ex-gambler.

In the bigger cities of the United States, emergency and information services are maintained by members. A desperate gambler can get help at any hour of the day or night by dialing the listing under Gamblers Anonymous in the tele-

## Are you a compulsive gambler?

Most compulsive gamblers will answer yes to at least seven of these questions, which are taken from Gamblers Anonymous literature.

1. Do you lose time from work due to gambling?

2. Is gambling making your home life unhappy?

3. Is gambling affecting your reputation?

4. Have you ever felt remorse after gambling?

5. Do you ever gamble to get money with which to pay debts or solve financial difficulties?

6. Does gambling cause a decrease in your ambition or efficiency?

7. After losing do you feel you must return as soon as possible and win back your losses?

8. After a win do you have a strong urge to return and win more?

9. Do you often gamble until your last dollar is gone?

10. Do you ever borrow to fi-

nance your gambling?

11. Have you ever sold any real or personal property to finance gambling?

12. Are you reluctant to use "gambling money" for normal expenditures?

13. Does gambling make you careless of the welfare of your family?

14. Do you ever gamble longer than you had planned?

15. Do you ever gamble to escape worry or trouble?

16. Have you ever committed, or considered committing, an illegal act to finance gambling?

17. Does gambling cause you to have difficulty in sleeping?

18. Do arguments, disappointments or frustrations create within you an urge to gamble?

19. Do you have an urge to celebrate any good fortune by a few hours of gambling?

20. Have you ever considered self destruction as a result of your gambling?



phone book. An answering service supplies the number of a member who's available at that time.

Members of Gamblers Anonymous swear by the organization. They say they've tried physicians, clergymen and psychiatrists, but they feel no one understands their problems until the moment they attend a Gamblers Anonymous meeting. "When I heard someone there speaking, it was as though it was me," says one man. The approach isn't successful with everyone, though. Some gamblers are back at the gaming tables six months after joining GA. "All the therapy in the world won't help the compulsive gambler if he doesn't want to be helped," says Henry. "You

have to have a dire need for help and a desire for it."

Here, then, is the reason why there are some gamblers who will never quit. As Dr. Herbert I. Harris of Cambridge, Mass., notes, gamblers, particularly card players, act like violent and daringly profane small boys, cursing each other in loud voices and threatening physical violence which is never carried out. They slap their cards on the table, they smash their golf clubs in childish fury. They swing from one mood to another.

In short, the need to be a child is, for whatever the deep-seated quirk may be, greater than the desire to achieve maturity and "stand on his own two feet."





## The pyramids of Kush

*Two thousand years after the Egyptians had stopped building pyramids, a little-known kingdom to the south was still constructing them for their royal dead.*

by L. Sprague de Camp

EVERYBODY knows about the pyramids of Egypt, and many have also heard of those of Mexico and Peru. Few, however, know that the Sudan has — or once had — more pyramids than any of these. They were the tombs of the rulers of ancient Kush.

One group of pyramids stands at the site of the ancient capital, Meroë, 150 miles down the Nile from Khartûm. Another group (divided into several sub-groups) is at Napata, still further downstream in the midst of the great, S-shaped bend that the Nile makes as it snakes through Nubia. The

total number of these pyramids — counting the small ones erected for royal relatives — was over 230. Most of them have disappeared as local peasants have hauled away the stones for use in their own walls and houses. But many still abide.

A few years ago, when I was in Khartûm, I undertook a trip to Meroë to see the pyramids there. I engaged a jeep and a driver, a young Khatûmi named Tejani; we left Khartûm at 6 a.m. for the 15-hour round trip.

Seeing dead camels lying by the roadside with vultures tearing at them, I thought that what I needed to add to the junk in my study was a well-bleached Sudanese camel's





Although the pyramids are smaller than Egypt's famous ones, their appearance is still impressive, and on some, the story of Kush, in worn hieroglyphs, can still be faintly seen.

skull. So I tried to tell Tejani what I wanted. Not knowing the Arabic for 'skull,' I said I wanted the *head* of a camel, *râs al-jamâl*. Oh, said Tejani, that would be easy. We should stop at Shendi, where I could buy a camel, cut off its head and take it with me! My wife is glad that I did not follow up this helpful suggestion.

We got to Meroë about two, in blistering heat. The city was nothing but a patch of potsherd-littered sand surrounded by barbed wire. It had not been excavated. A short distance away rose a low hill, on which the pyramids formed a battered crown. The main group contained about 20 pyramids, and a smaller group to the south, half a dozen more. In addition, there were heaps of rubble marking the sites of destroyed pyramids, and some bits of ruined wall.

A wilderness of sand and dark reddish-brown rock spread out in

all directions. The rolling plain shimmered in the scorching heat. There was no sound except the faint buzz of flies.

The largest pyramids were only about a third or a quarter the height of the big pyramids of Egypt, but their total mass was impressive. They were all made of a dark red sandstone. The best preserved had a walled vestibule in front. On these walls, one could trace the worn reliefs, in Egyptian style, of the kings of Kush slaying their foes and adoring their gods, and the weathered hieroglyphs that celebrated these rulers' virtues and triumphs.

The kingdom of Kush—the Ethiopia of the Greeks—occupied most of the territory of the present Sudanese Republic for 1,100 years. Although not a highly progressive country, Kush was not altogether deficient in the arts of peace and war. It became a center of the an-



Some pyramids built by the kings of Kush still stand, but many have disappeared.

cient iron industry, and the kings of Kush once conquered Egypt itself.

The Egyptians sometimes called their southern neighbor Ta-Kenset Nehesu, "the land of the blacks," and sometimes "abominable Kash." The Hebrews turned "Kash" into "Kush," the "Cush" of Genesis X, 6. The Greeks translated the longer Egyptian name as Aithiopia or Ethiopia, "land of the burnt-faces."

Much later, when the people of the Abyssinian highlands were Christianized in the 4th century of the Christian Era, they found the name "Ethiopia" in the Bible, the Greeks having used this name as a translation of the Hebrew "Kush."

When the Bible was translated into Ge'ez, "Ethiopia" came out as "Iteyopeyá." When the Abyssinians acquired national self-consciousness, they adopted this name for their own country, which bordered but was quite distinct from the historical Kush-Ethiopia. And 'Iteyo-peyá, or Ethiopia, it remains to

this day. When the Arabs conquered the original Ethiopia, they called it Balad as-Sudân, "land of the blacks." And this name, too, has persisted.

The people of the Sudan are various, many being notably brave and warlike. Most belong to a racial type sometimes called "Hamitic," but more accurately "Erythriotic," since "Hamitic" is properly a linguistic term. They are of rather slender build, with curly rather than kinky hair, and sharp features of the European type, but skins of Negroid blackness. They are usually classed as one of the types or sub-races of the Negroid race, although they are in many ways intermediate between the other Negroids and the Caucasoids or whites.

In addition, the southern Sudan has the immensely tall, lean Nilotic Negroes. In the southeast and southwest occur tribes of the large, muscular, broad-nosed Forest Negro type. In the northeast, the native strains are much mixed with Arab blood.

After centuries of invasion and exploitation of Kush by the far more advanced and powerful Egyptians, a Kushite monarchy arose about 800 B.C. Egypt was then in feudal disintegration. The kings of Kush were able to conquer Egypt. They constitute the 25th, or Ethiopian Dynasty of Egypt.

The Kushite king then, Taharqa, became embroiled with the terrible Assyrians, who in a series of bloody campaigns drove him and his successor south into Kush. The Kush-



ite kings continued to reign from their capital at Napata on the Nile, near modern Merawi. We know but little of their reigns, save for a few inscriptions. The Kushite ruling class copied Egyptian customs, importing Egyptian scribes to design monuments with inscriptions in Egyptian.

The king wore an outfit like that of Egyptian kings, with an embroidered linen kilt and an elaborate headdress bedight with golden hawks, cobras and other ornaments. In addition, the king's cheeks were marked with the zigzag tribal scars used in the Sudan to modern times. The queens, who were hugely fat, wore long, gaudy skirts, but usually went bare above their waists.

When the Persian king Cambyses conquered Egypt in 525 B.C., he sent an army to Kush, but this army perished. Later Persian kings conquered the northern part of Kush, which we call Nubia. Farther south, however, the Kushite kings continued to reign. They had moved their capital from Napata—now either in Persian hands or uncomfortably close to the border—upstream to a place they called Barua, or Meroë in Greek. Here they ruled for many centuries.

Along with other Egyptian customs and beliefs, the Kushite dynasty took over the custom of pyramid building. At Napata and Meroë, they left over 70 royal pyramids and over 150 smaller ones for their royal kin. They continued building pyramids down to the fall of the kingdom around A.D. 350,

two thousand years after the custom had ended in Egypt!

From the inscriptions on and inside these pyramids, archaeologists have pieced together the outline of Kushite history. During the earlier centuries of this thousand-year kingdom, inscriptions were made in Egyptian picture-writing. Later, the Kushites switched to a native tongue, called Meroitic. This writing, like Etruscan and Mayan, has been only partly deciphered and may never be completely solved.

Since there is much iron ore in the Sudan—around Meroë for instance—the Kushites became major producers of iron. Piles of debris, which may be the slag heaps from their refineries, still dot the landscape. From Kush, knowledge of iron smelting trickled down to the Nilotic Negroes on the upper White Nile, and thence, probably, it penetrated Negro Africa generally.

In the 4th century, the Kushite kingdom fell to a new power, the Axumite kingdom. Adventurers from Arabia had set up a kingdom at the town called Auxoumis by the Greeks and Axum by the Romans (modern Aksum) in the northern Abyssinian highlands.

Later, Kush was divided between the Christian kingdoms of Alwa in the southeast and Dongola in the northwest. These held out against the advancing Muslim tide until the 14th century, when Islam swallowed them up. Since then, the country has been gradually Arabized in language, religion, custom, dress and genes.



LSD  
and broken chromosomes



IN the jargon of the drug-taker, an unfortunate experience with LSD (lysergic acid diethylamide) is known as a "bad trip." The trip, in fact, may be even worse than the user realizes, for in addition to the psychological effects, there is evidence that LSD not only can damage the user's chromosomes, but may cause chromosome breaks in the offspring of women who take the drug during pregnancy. This is the conclusion of three investigators who recently presented their findings to an Academy Conference on Pharmacogenetics. They have also published reports of their study in *Science* and *The New England Journal of Medicine*.

Initiator of the investigation was Dr. Maimon Cohen, director of cytogenetics, division of human genetics, State University of New York at Buffalo School of Medicine. He added LSD, in doses from 100 to 0.001 mcg/ml, to blood cell (leukocyte) cultures from two healthy donors. The larger doses, as expected, arrested mitosis (cell division) and killed the leukocytes. Smaller amounts, with the exception of the 0.001 dose, caused twice as many broken and abnormal chromosomes in leukocytes as in untreated cells cultured from the same donors.

While the *in vitro* studies furnished concrete evidence of the effect of LSD on blood cells, it did not answer the question of whether the drug actually caused chromosome breakage in living beings. Dr. Cohen had reason to believe it did,

for he and his associates had studied the leukocytes of a patient who had undergone extensive treatment with LSD in conjunction with psychotherapy for paranoid schizophrenia. From September 1960 to March 1966, the patient had had a total of 15 treatments. Leukocyte cultures were examined eight months after the last treatment, there being no other known ingestion of drugs of any kind during this interval. Of 200 cells in metaphase of the patient treated with LSD, the chromosome breakage rate was more than three and a half times that of other schizophrenic patients, 12 percent as compared to 3.7 per cent.

To help him accumulate more information about the effects of LSD on living humans, Dr. Cohen enlisted the aid of Dr. Kurt Hirschorn, professor of pediatrics and chief, division of medical genetics, Mount Sinai School of Medicine, and Dr. William A. Frosch, assistant professor of psychiatry, New York University School of Medicine. Dr. Frosch obtained the participation of 18 patients in a Bellevue Hospital clinic for LSD users. Ranging in age from 19 to 52, the volunteers had been taking LSD for from two weeks to eight months. Several had taken only two or three trips; one, a 19-year-old boy, had taken 300 trips. The usual dose of

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LSD was between 300 and 600 micrograms.

"In every case," stated the researchers, "there was an increased chromosomal damage above the mean control value. This increase is more than three times the control mean and is highly significant. There was no apparent correlation between number of doses, amount per dose or the interval between last dose and time of bleeding for leukocyte culture and the frequency of chromosome breaks."

### LSD users experiment

Also, there was no apparent relation between the type and number of other drugs taken and the break frequency. This aspect of the study is important because the vast majority of LSD users are inveterate experimenters with such other drugs as phenothiazines, opiates and anti-histamines. For example, patients receiving chlorpromazine, often used to stop a bad LSD trip, showed a marked increase in broken chromosomes; however, eight of the 18 patients not exposed to chlorpromazine also demonstrated increased abnormalities.

The mechanism of chromosome breakage is as yet unknown. Experimental data, however, suggest several possibilities. Breaks similar to those induced by LSD have been found to occur spontaneously in three autosomal recessive diseases: Bloom's syndrome, Fanconi's anemia and ataxia telangiectasia. "Patients with these syndromes also

show a high propensity to leukemia and other neoplasms," said Drs. Cohen, Hirschorn and Frosch in the *New England Journal*. "In this context, cells of neoplastic origin almost invariably illustrate a variety of chromosomal aberrations, many of which are not unlike those seen after LSD exposure. Moreover, many agents known to produce similar aberrations (such as radiation in man and other species and viruses in laboratory animals), are known carcinogens. One of the obvious potential dangers, therefore, of exposure to agents such as LSD is the possible future increase in the incidence of leukemia and other neoplasms in the persons exposed."

The possibility that LSD, taken during pregnancy, can produce chromosome damage and congenital defects in offspring has been demonstrated in laboratory experiments with rats. The studies suggest that the effects of the drug on the offspring may be dependent on the stage of the pregnancy during which it is administered. Two rats exposed to LSD early in the pregnancy cycle showed a high frequency of chromosomal damage, while two others from the same mother showed little or no increase in breaks after exposure to the drug later in the cycle. Complications associated with the ingestion of LSD by rats include embryonal absorption, stunted growth and cerebral malformations.

In the Bellevue study, there were four offspring who had been exposed to LSD; all had chromosome



*The possibility exists that LSD can produce chromosome damage and affect an unborn child.*

breaks. While no obvious physical or behavioral abnormalities have been noted in the children, there is evidence that chromosomal damage is retained for a long time; one two-and-a-half-year-old child had chromosomal damage in 13 percent of her leukocytes.

The extent to which LSD-induced chromosomal damage in children may be responsible for birth defects is presently being studied by a research team at the University of Iowa. Dr. Hans Zellweger, professor of pediatrics, Dr. John S. McDonald, resident in obstetrics, and research assistant Gisela Abbo cited the case of a girl with a malformed leg born to a 19-year-old woman who had taken LSD on the 25th day after her last menstrual period and three times between the 45th and 98th days. Her husband had also taken the drug. "The child presented the typical picture of the unilateral fibular aplastic syndrome. It is important to note that the most active differentiation of the lower limb occurs in the seventh week of gestation. Moreover, in investigations of thalidomide embryopathy, leg abnormalities were noted on those infants whose mothers had taken thalidomide between the 42nd and 47th days after the last menstrual period. Since [this] mother ingested the second dose of LSD exactly during the period critical for the produc-

tion of leg deformities, it does not appear unreasonable to suspect a causal relationship between the LSD intake of the mother and the fibular aplastic syndrome of the child." Dr. Zellweger and his associates emphasized that additional research is necessary before a direct connection between chromosomal aberrations and malformed offspring can be established.

#### **Damage to future generations?**

A danger that concerns many involved in LSD research is the potential chromosome damage to the gametes, or germ cells. Chromosome rearrangements produced by breaks and subsequent incorrect healing result in structural anomalies, including balanced reciprocal translocations. Evidence exists that segregation of such translocations and the resulting chromosomal imbalance leads to a high percentage of offspring with congenital anomalies and mental retardation. "Since the carrier of such balanced translocations is clinically normal, as are many of his offspring," said Dr. Cohen, "the consequences of the chromosomal imbalance may not appear for several generations. The total damage caused by LSD to the human population, both genetically and psychologically, therefore, may not be assessable for some time to come."



# CODE 99

**"A**TTENTION please! Attention please! Code 99!" This announcement coming from the public address system of St. Vincent's Hospital in New York City sparks a series of events calculated to save the life of someone dying from a severe heart attack. A trained team of doctors and nurses speeds into action, and within seconds they are at the patient's bedside. Each member of this team, sometimes as many as 20, has his particular, pre-

arranged duty to perform in the organized ritual of life saving. New techniques in artificial respiration and circulation, which are responsible for reviving people who would not survive otherwise, prompted the organizing of this unique emergency team. If doctors can get to a patient in the first four minutes of attack, before his brain begins to die, his chances for living are best. Code 99 and the men and women behind it insure that chance.

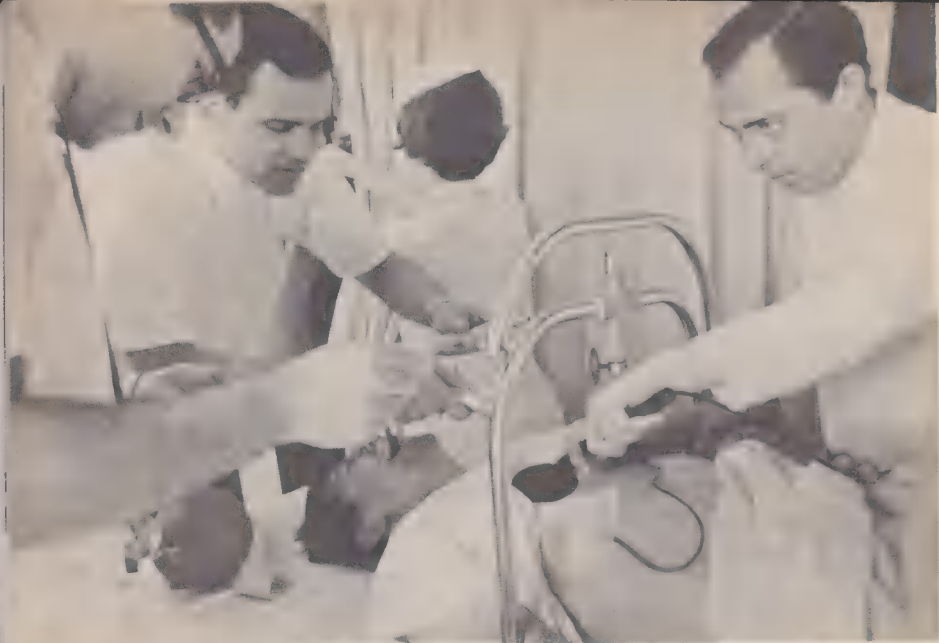
Code 99 alarm is sounded, alerting the emergency team to a patient's bedside. These doctors waste no time in going for the equipment needed to save his life.

Within seconds after the signal is issued, doctors and nurses have EKG and other necessary equipment on the way to the patient, a victim of cardiac arrest.

Three Lions Photos



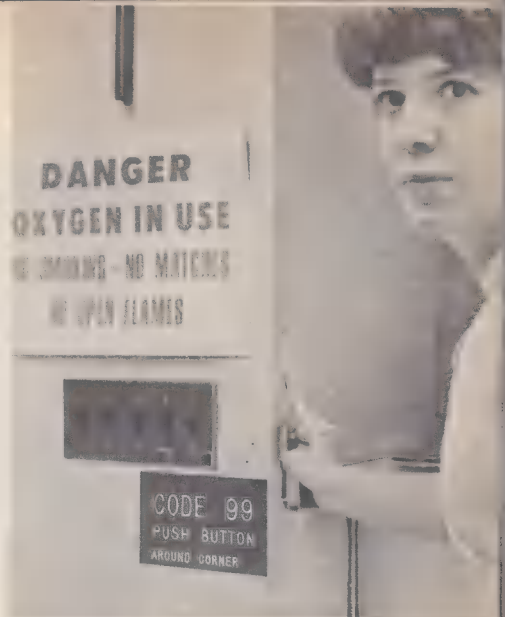




**Above:** Doctors apply external cardiac massage apparatus to shock heart into action, and nurse prepares injection of sodium bicarbonate to neutralize body acids.

**Below:** Doctors and nurses lift the patient so that his lungs can be heard with a stethoscope, and the emergency team is one step closer to saving the man's life.

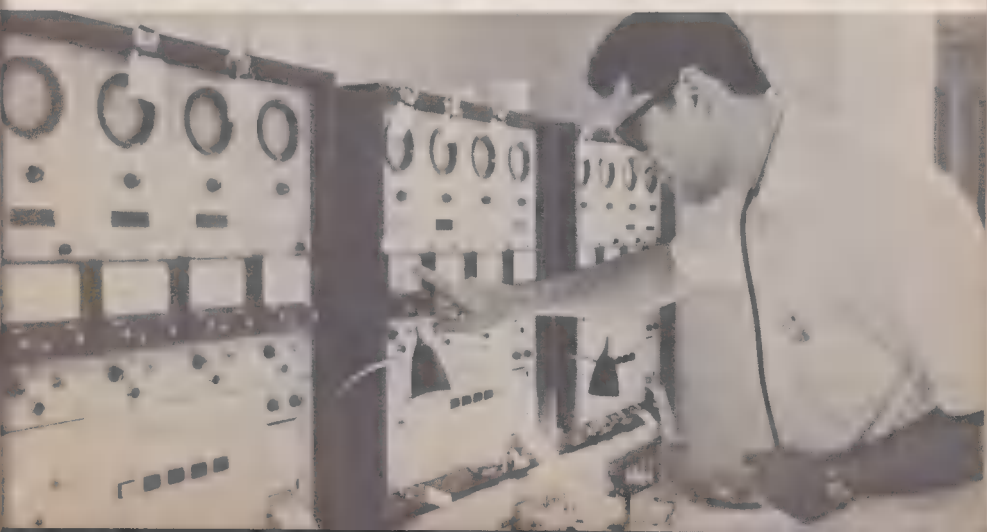


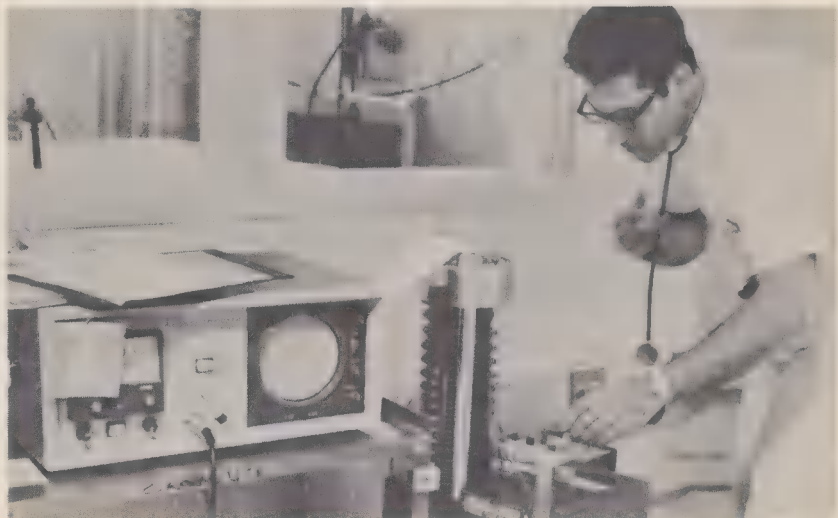


Above: The whole procedure begins when this button is pushed. Someone is dying of heart failure, and there are four minutes to restore breathing, heart activity.

At left: A doctor monitors and interprets tape from EKG machine on patient shortly after Code 99 is put into effect. In background, others continue efforts to save.

Below: The same doctor is now shown at the central cardiac monitor unit waiting for an automatically generated electrocardiogram on the heart failure patient.





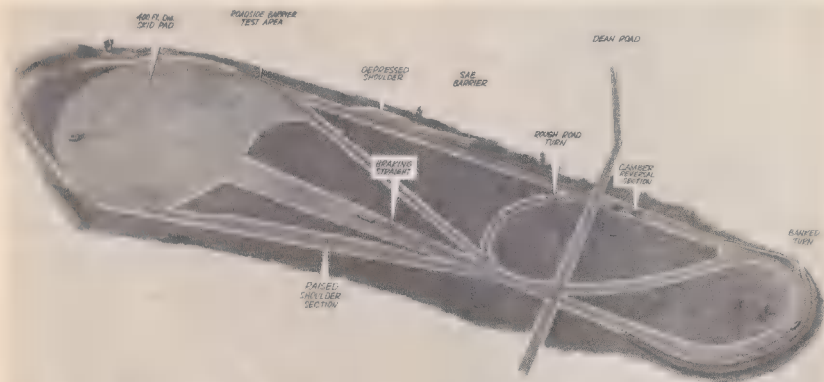
**Above:** Before the Code 99 call has been sounded, but preparing for the possibility, the doctor examines the automatic respirator, one piece of equipment used.

**Below:** The reward comes when the patient regains consciousness. His chest may feel as if it has a heavy weight on it, from severity of external massage, but he's alive.





## Science Month



This strange-looking roadway will be used for testing in Cornell Aeronautical Laboratory's vehicle safety program. It will include turns, dips, shoulders, a skid pad which can be flooded with snow or water, and other conditions typically found on roads.

## Phony accidents to save lives

**A**UTOMOBILE crashes without the crash will take place at Cornell Aeronautical Laboratory soon as part of a large-scale vehicle safety program.

The "crashes" will be simulated by a high speed impact machine which can accelerate a sled-like vehicle to a speed of 45 miles an hour in just five feet. The rapid acceleration duplicates the severe deceleration that takes place in a real crash and creates virtually the same effects.

Life-like dummies seated in the sled will face the opposite direction to the sled's movement to simulate a frontal impact. For a rear-end collision, the test objects will be turned to face the direction of

the sled's movements.

The force that accelerates the sled is compressed air at pressures up to 3,000 pounds. When a button is pushed, the pressurized air rushes against a floating piston, which propels the sled. Pneumatic brakes stop the vehicle.

The acceleration sled is the only one of its type and capabilities in the nation outside the auto industry itself and U.S. Government installations, Cornell notes. Most of the government machines are used in the aerospace program.

Cornell's vehicle will be used to evaluate virtually every part of a vehicle that affects occupant safety. For instance, it may test new kinds of car seats, occupant restraint sys-

tems and other protective devices.

The test objects in the sled will be highly instrumented to provide data, and high-speed cameras will photograph the action in color.

The sled is just one of a number of facilities planned for Cornell's new vehicle experimental laboratory. Roadways of various materials will incorporate turns, roughness and slope, and a "skid pad" will be capable of being flooded

or covered with artificial snow.

Other facilities will include a highway shoulder to show what happens when cars run off the road, and a roadway loop with turns, dips, rises and runs that will be typical of country roads in the U.S.

The acceleration sled is expected to be in operation before summer, together with some of the other facilities.

Helium Centennial Time Column being built in Amarillo, Texas, is for the 100th anniversary of the discovery of helium. Columns, all to be opened by 1968, will contain artifacts sealed in helium. Four spheres surrounded by two elliptical rods are molecular structure — two neutrons, two protons, surrounded by two electrons.

## To be opened in 1968

In the year 1993, a chamber in a 60-foot-tall stainless steel monument now being erected at Amarillo, Texas, will be opened to reveal artifacts sealed in helium that relate to man's dependence on natural resources. Other chambers will be opened in 50, 100 and 1,000 years.

The project is designed to focus attention on the need for preserving natural resources, particularly helium, which is in short supply in this country. Scientists say that the present supply should last sometime beyond the year 2000. The element was discovered only 100 years ago, and the time tower is being built as part of a centennial celebration.

More than half the helium produced in North America today is used in the U.S. space program, where it forces fuels into rocket engines and pressurizes empty tanks. Light and inert (incapable of combining with any other element),



helium is ideal for these tasks in space vehicles. The element is found in natural gas.

## Saguaro — a dying symbol

What's killing the giant saguaro cactuses of the Southwest?

A lot of people are arguing that question in the southwestern states, where the saguaro population is diminishing, says the *New York Times*. In the deserts of the area, gaunt saguaro skeletons attest to the plant's decline.

Saguaros that sprouted before the American Revolution are dying. Even more significantly, few, if any, younger saguaros are seen in some areas.

The saguaro is the unofficial symbol of the entire desert Southwest, and its waxy white blossom is Arizona's state flower. Some plants reach heights of 50 feet and weigh 10 tons or more.

Theories on the decline of the saguaros vary. Some think a disease called bacterial necrosis, which attacks damaged plants, is being spread by moths. Plant biologists, however, say necrosis is nature's way of removing the remains of any dying plant.

Another theory holds that the climate of the Southwest was more favorable to saguaros a couple of hundred years ago.

A saguaro may live a couple of hundred years—no one knows their actual life span—but it has many



Although you may not recognize it as such, this is the Surveyor 7 and how it might look at final descent for its soft-landing on the moon. Maze of electronics gear shown is mounted to the triangular frame of a test model during a check-out at Hughes Aircraft Company, Culver City, Calif., the makers of all seven Surveyors.

enemies. Cattle trample them, erosion sends floods down on them and animal predators attack them.

When saguaros are in poor condition from drought, any superficial injury can be fatal. Their ability to store water can be a hazard if a sudden freeze hits them.

Under favorable conditions, however, a saguaro can even survive



having an arm torn off. The cavity is quickly healed and often becomes a nesting place for birds.

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## The choir Russia orbited

In the spring of 1961, a monitor listened incredulously to his radio. The sounds he heard were coming from a space vehicle. They were a large number of voices singing—in Russian. An orbiting choir? The idea was ridiculous.

Still, it happened. A Soviet scientist reveals in *Pravda* that a recording of the Pyatnitsky Choir was played on a test flight that preceded the first manned orbit of the earth on April 12, 1961.

The articles in *Pravda* were signed with the name of Aleksei Ivanov, which is thought to be a pseudonym for a leading scientist in the Soviet space program, according to the *New York Times*.

The scientist describes how the Soviets wanted to use a voice recording on the flight to test radio communications. They were afraid to use a countdown for fear the West might hear the numbers and think the Russians had put a man in space.

The Soviets then hit upon the idea of a song, but discarded that, too, because they thought the West would declare that a Russian astronaut had gone crazy and was singing in space.

Finally they came up with an ingenious plan: they would use a

recording of a choir. "It was unlikely that Western reporters would go so far as to proclaim that the Russians had put an entire choir into orbit," the writer of the articles says.

The test went off as planned and nothing was heard from the West about a Russian orbit until Yuri Gagarin made the first manned flight a few weeks later.

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## Heart disease and sex

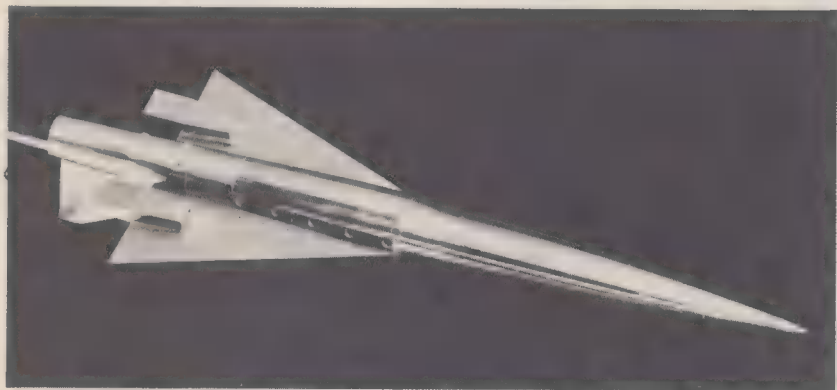
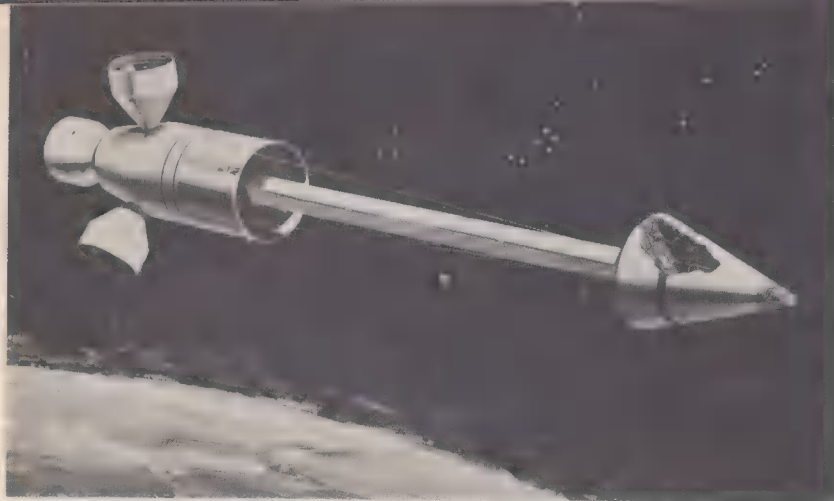
Coronary heart disease is a reversible process in the steelhead trout, two researchers from the University of Washington School of Medicine suggest in *Science*.

Steelheads, unlike salmon, survive to spawn a second or even a third time. At the time of spawning, almost 100 percent of them have abnormal coronary arteries but when fish that have spawned were examined a year or two later, they were normal.

Later, during another spawning, these second-time spawners developed coronary lesions again, but their lesions were indistinguishable from those of first-time spawners.

The incidence of coronary degeneration in steelheads grows as the fish approach the spawning stage, the researchers point out. They found no evidence of abnormality in juvenile fish which hadn't yet migrated downstream.

Over half of the fish taken in salt water near the entrance of the



Two models undergoing tests for National Aeronautics and Space Administration. Above: Cone-shaped nuclear generator (right) trailing behind a large space laboratory may be one way of meeting electrical power requirements of future orbital flights lasting up to five years. A radiation shield on blunt end of atomic power plant would throw a low radiation "shadow cone" 80 feet in diameter around space station. From Douglas Aircraft. Below: Stainless steel wind tunnel model of a hypersonic transport has been tested at 500 to 7,000 m.p.h. It is simplified for study of aerodynamics.

spawning streams had evidence of vascular degeneration, however. Just inside the Columbia River, 14 out of 17 had abnormal coronary vessels.

Further upstream, 63 out of 69 fish had coronary vascular degeneration. Near the spawning beds,

the incidence of heart disease leaped to 21 out of 22.

The heart abnormalities noted in spawning steelheads are not related to age, the researchers add. Chronologically older fish taken at an earlier stage of sexual maturity had normal coronary vessels.

## NEW FOR PEOPLE



Travel of the future is in planning stages at Ford Motor Co., 20000 Rotunda Drive, Dearborn, Mich. One automated guideway system under study uses built-in guide rail (above). Control arm would extend to hook onto power rail on automated highways, with car operating under computer control.



Insert key, turn on, and you're off, so to speak. Power mowers that start electrically come from Goodall Manufacturing Corp., P.O. Box 378, Winona, Minn. The built-in battery has a recharging unit in standard 110 volt household electrical system. The key-activating on switch is for safety.



Keystone

"Hear-yourself-speak" mask, made by a Japanese firm, is designed to help public speakers improve their "microphone" voices. It enables one to hear how his voice sounds, so he can correct any faults.





Wall-mounted radio controls can operate single or double overhead garage doors. Berry Doors, of the Stanley Works, New Britain, Conn., have designed the Stanley-Berry Satellite "27" radio receiver for the house and the portable hand transmitter for car.

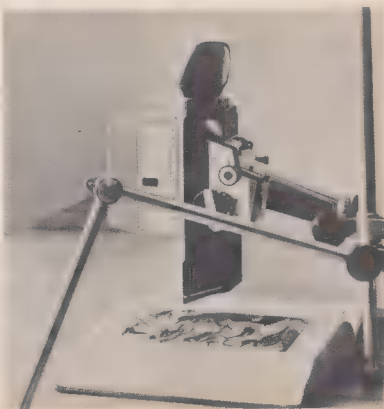


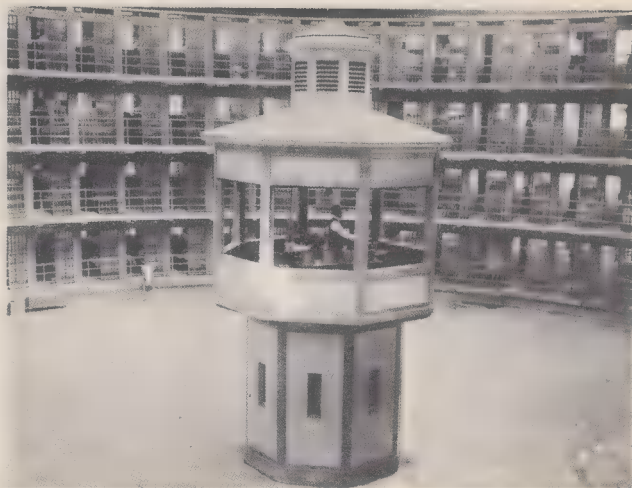
The latest in letter writing is called a Smith-Corona Mail Call. It is a set of two completely self-contained units. Each can record and play back. Inside is the transmitting device—a small return loop tape cartridge, the Smith-Corona Letterpack. Letterpacks are easily removed and mailed. SCM Corporation, 410 Park Avenue, New York, New York.



The strange looking machine next to the girl is an electrically controlled pneumatic system designed by United Air Lines to test seat durability, comfortability. It simulates stress of 165-pound person.

New movie camera that films at distance or at one inch without attachments is called the Bolex 155 Macrozoom. Pailard Inc., 1900 Lower Road, Linden, N. J.





K.F.S.

*If Chinese communists could brainwash our GIs to an alien philosophy, why not use similar techniques, plus the best modern educational methods, to imprint reason, honesty and decency on the minds of criminals, asks this famous man in a startling, thoughtful proposal.*

## Let's brainwash our criminals

by Steve Allen

**M**ANY people who deplore criminal violence seem to have an insatiable appetite for it, to judge by the popularity of television and radio programs, motion pictures, books and periodicals that depict murders, kidnappings, assaults, rapes and burglaries.

Society, I suspect, would feel cheated if someone were to invent

a pill that could convert a murderer into a decent, law-abiding citizen.

Well, society had better get interested in a change soon. The present crime wave is going to assume tidal proportions in the years ahead. Hiring more policemen and making penalties more severe will not solve the problem. The typical American prison is anachronistic and harmful.

For thousands of years society has punished neurotics and psy-

chotics. The sicker they were, the more severe the punishment. It hasn't worked. But society has rarely given up practices simply because they haven't worked. The truth is, we tend to overlook the fact that a crime is essentially an irrational act.

Does punishment deter irrational acts—crime? The rate of repeatism in the federal prison system increased from 61 to 67 percent between 1949 and 1958. It has been argued that a young man who has never been punished by society might somehow feel immune from retribution. But the same cannot be said for a man who has already spent several years in prison. He knows the nature of the punishment that faces him. He has had ample evidence of the misery, the degradation, the monotony and general horror of prison existence. Nevertheless, he is irrational enough to go back to a life of crime as soon as he is released.

Man, in general, reasons more poorly than he supposes. We are creatures of strong physical and animal needs from the moment of birth. Only gradually and painfully do we learn to reason. Most of us, unfortunately, do not learn very well. Even at our fullest intellectual development, we still carry within us a tremendous burden of factual ignorance, erroneous information, superstition, prejudice, fear, hostility and other detrimental baggage.

These powerful emotional undercurrents enable us to stifle concern over possible detection, conviction

and punishment. If detection and punishment were certain and immediate, formal deterrence might work. Tell a thirsty man that if he drinks a cold glass of water placed before him he will be shot on the spot, and he will not drink it—unless he becomes maddened by thirst. He may then suspect that you do not really mean what you said about shooting him. Or he may gamble that your courage will fail. Or he will decide that the momentary satisfaction of assuaging his thirst is worth dying for.

But, in reality, deterrence always has been pretty much a failure. Millions of people believe in a real, material hell, with actual flames that burn actual bodies. Yet their conduct does not appear to be statistically different from those who do not share such a belief.

Some will argue that if threat of imprisonment is no deterrent, then prisons ought to be abolished. I see no reason why the assumption must lead to the conclusion. It could still be argued that prisons protect society simply by keeping dangerous people off the street.

No society has ever justified its prison system purely on this thesis, however. Prisons have sprung up as the result of a tendency to do something "civilized" with offenders. In early times evil-doers were torn limb-from-limb, drawn and

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Condensed with permission from a paper delivered by Steve Allen to the California Probation, Parole and Correctional Association Conference.



quartered, eaten alive by animals, burned at the stake, skinned alive, boiled in oil, stoned, crushed, impaled on spears, crucified, strangled, shot and so forth.

For lesser offenses, eye-for-an-eye "ingenuity" was employed. A man who lied might have his tongue torn out, a spy might have his eyes gouged out, a thief might have one or both hands chopped off. This last punishment persists to this day in parts of the Arab world.

Parenthetically these barbaric atrocities have not been inflicted by demented criminals, but by the authority of the state, frequently with the blessings of the church.

### Death or banishment

We in the West like to believe that human rights are more precious to us than property rights. But when we turn from pious theory to practice, something gets lost. As the European masses broke from feudalism, attacks upon private property increased. More than 200 offenses were punishable by death. Not every criminal could be killed, under the new enlightenment, so more were locked up. Some were put on sailing ships and banished—not always to Australia, either. Many were sent to America.

The first English prisons were the workhouses. It would be impossible to exaggerate the horror of them. They housed not only criminals, but the insane, the impoverished, lepers, women and children.

In the United States, Dr. Benja-

min Rush, a signer of the Declaration of Independence, proposed that criminals be classified and segregated. Gradually two philosophies of imprisonment emerged. One, the Pennsylvania System, was based on solitary confinement and hard labor. The other—the New York, or Auburn, system—held that absolute silence would improve the prisoner. Both were nonsensical and cruel. Eventually they employed beating, flogging, strait-jackets, chains, thumbscrews and other forms of torture.

Every penal system in turn has come to be recognized as generally a failure. Certain side-approaches had value: probation, parole, democracy within the convict population, the industrial prison. Finally the idea of offering the prisoner a few educational opportunities emerged. After that the ideal of psychological counseling was introduced. I use the word *ideal* to suggest that little has been done to develop the kind of sweeping program that is really required.

My own prescription is a revolutionary and radical one.

The field of psychology has yielded up a considerable body of knowledge and theory concerning the impressionability of the human mind. Chinese Communists apparently were able to take perfectly average GIs, brainwash them for a few months, and produce important changes in their basic outlook. Think of it! In a few months of daily indoctrination—without resort to torture or drugs or any

James Bondian devices—men who had lived 20 or 25 years in one culture were induced to accept ideas of another in which they had spent only a short time.

These same techniques, among others, ought to be used in a new kind of model institution to promote reasonable and socially useful ideals and attitudes.

The success of the Chinese admittedly was less than is popularly supposed. But this does not mean that nothing can be learned from the experience. Communism is an unattractive philosophy to Americans. Communist purges, slave labor camps, subversion, firing squad executions, Berlin Walls, etc., have produced in most American minds an unsympathetic image of communism. Let's assume we are trying to sell worthwhile products—reason, honesty, decency and other civilized virtues. The results might well be different and better.

The Synanon experience in rehabilitation of narcotics addicts, and the effectiveness of Alcoholics Anonymous, have given a number of interesting results. One reason is that the addicted individual is approached by someone who has successfully overcome the identical predicament, rather than someone who simply lectures from a position of virtuous, inexperienced authority. Our model institution, therefore, should include some staff members who are former convicts. Synanon has succeeded not only in curing addicts but in imbuing them with a desire to help other troubled people.

U.P.I.

Steve Allen is remembered by most of us as a TV star. A few know that he is deeply concerned with social problems and has made scholarly studies of them.



This suggests that it might be possible to select and train individuals from the prison population.

Experiments could be conducted in sensory deprivation, or sensory restriction. Studies undertaken in 1957 at Princeton University showed that immediately following periods of isolation the capacity of subjects for learning certain kinds of material was improved. Here is something that deserves further study. Experiments in sleep deprivation may also hold clues that would be valuable.

It has been determined that one of the most important factors connected with indoctrination procedures is isolation—not only physical isolation, but separation from one's culture group. There is an opportunity in prisons to initiate experimental procedures which, regardless of the degree of their effectiveness, are clearly preferable to the treatment presently accorded a majority of those incarcerated.

Since monopoly of influence is desirable, a *small* institution is better than a giant one. At present, a state prison inmate spends most of his time in the culture of other prisoners, whose values may contradict those that the authorities

are trying to inculcate. He is faced with a conflict between his new desire for civilized conduct and his previously established sense of loyalty to the rest of the prison group, to which he feels he belongs. Even in the absence of any such sense of group loyalty, there is sometimes the fear of retaliation or contempt from the peer group, for being a "stool pigeon." These considerations support the idea, not only of a small total inmate group, but its subdivision into even smaller and more manageable teams.

### Group influences actions

Actually, advantage can be taken of a susceptibility to "go along with the group." A good example is the experiment in which an individual is told he is one of a group of five being tested. In reality, the other four apparent subjects are cooperating with those administering the tests. A simple question is asked, to which the four "shills" deliberately give an incorrect answer. In a high percentage of cases an individual will deny what he knows to be the correct answer simply because the majority response makes him doubt the validity of his own initial response. Why shouldn't the same principle be applied to the rehabilitation of anti-social minds?

The learning process is already going on in our prisons. After spending a year or two in a prison in the company of more experienced criminals, a youngster comes out knowing exactly how to jimmy a

door, where to go to buy or sell narcotics, how to hold up a bank. Therefore we are not concerned to debate the question: Should a man learn anything in prison or not? He *is* learning something. Much of it is bad. It is, I admit, possible for a man to acquire some formal education in arts and crafts in prison today, but present programs represent a drop in the bucket.

One of the tragic lessons being learned by the Head Start Program is that, while dramatic improvement can be made in the learning ability of small children who live in poverty areas, these same children tend to fall back into their former condition. Powerful influences in home and neighborhood tend to defeat the influences available in the schools. The hard truth seems to be that we can't properly educate young people who continue to live in a ghetto. In a totalitarian society you solve this by ordering the children out of the ghetto and into boarding schools. But we are not a totalitarian society.

There is one situation, however, when at least a small percentage of socially deprived young people are forcibly taken out of their slum homes and neighborhoods. That is prison. What an opportunity to educate and indoctrinate a captive audience! What are we waiting for?

But what kind of teaching am I talking about? Two kinds: Standard academic teaching, and intensive, out-and-out brainwashing designed to produce important personality changes. I am not com-



*Inmates need personal attention so they can retain some sense of individuality and dignity.*

petent to map out a complete program. As for grade school, high school and college curricula, I should think them essential.

For mind-changing indoctrination, I would rule out practically nothing. Closed-circuit television would be a must, as would tape-recording and playback equipment, with earphones available for individual concentration. High-quality public address equipment for simultaneous communication to all hands is possible. Lectures and informal talks by prominent authorities should be part of the program. The presence of public figures would suggest to patients that society is interested in them and cares.

The institution should be provided with teaching machines and programmed instruction books and devices. Instructions in remedial reading and speed reading would be essential. Video-tapes and motion picture films that were not only instructive but interesting—even entertaining—would be important.

Fundamentals of psychology and a course in general semantics might do wonders. General semantics programs already have proved strikingly effective in a few prisons. The patient would be photographed, and shown the pictures, tape-recorded and made to listen to the sound of his voice, patterns of his speech, the techniques of his thinking. He should be given standard

psychological tests. The results should be discussed with him in whatever way medically qualified supervisors deemed best to bring the man into realistic focus in his own eyes. For probably the first time in his life the patient would be given an enormous amount of personal attention, made to feel a sense of dignity and importance. There have been startling conversions of hardened criminals through religion. It should be tried.

### **Restore self-respect**

The kind of institution I envision would set out deliberately to "coddle" inmates—but not in the literal sense. Inmates would *not* be served breakfast in bed, offered a choice of dinner entrees, given manicures or massages or driven to nearby golf courses. The institution would, however, make up to the inmate for the deprivations, raw deals and shortchanges that society has generally meted out to him since his birth. This might include good food, instructions about proper diet, the prescribing of decent medicines used in a normal home environment, ■ complete athletic program, an educational system, a library, a music room, the privilege of wearing something other than a prison uniform on special occasions. By such means, "authority" would be saying, "You have committed a

crime and been deprived of the freedom to live in your accustomed environment. But you have not been sent here to be beaten, intimidated, starved, ignored, rejected or brutalized. We have one objective: to help you to help yourself."

We have ample evidence that the best efforts to control or alter human conduct rely on developing self-control and self-direction in the patient, not on authoritarian, external control.

### **It's a family affair**

It is commonly assumed that the home is the place where sound attitudes toward social responsibility, sex, marriage and parenthood are learned. There is increasing evidence, unfortunately, that it is within the American home itself that much serious social trouble originates. The rehabilitative program I recommend, therefore, should have as one of its parts a method for involving the inmate's home environment through consultation and participation.

Primitive man commonly asked the question "what?" (What is that light in the sky? What is the stranger—friend or enemy?) Later, he asked "how?" (How can I tie these sticks together? How can we make fire?) Finally comes "why?"

Today we consider ourselves civilized and intelligent. We should be asking "why?" about a lot of things. *Why* does a prison look like a prison? The architecture carries an 18th century influence, when

prisons were designed to keep dangerous people in. They were copied, at that time, from structures that were designed to keep dangerous people out—castles and fortresses.

It is no longer necessary that a prison resemble a medieval fortress. We have better means in this age of electronics for maintaining effective security. The prison of the future should look as little like a prison as possible. Nor need it be isolated from the community. Is it because we don't want to face the reality of our mental hospitals and prisons that we hide them from our sight behind the nearest mountain range, or on a bleak island? The chief result of this stupidity—whatever the reason for it—is that patients or inmates are deprived of the important benefits of easy contact with families and friends.

What I propose is visionary and utopian. Such rehabilitation for criminals will not be constructed tomorrow. But what I propose is easier than creating nuclear weapons or putting a man on the moon.

What would a pilot institution cost? I don't know or care. More than two and a half million offenders move through our prison system each year, many of them recidivists. State and local governments spend roughly one billion dollars a year keeping convicts locked up, but less than a fifth of that trying to rehabilitate them. Fewer than four percent of prison staff people are concerned with treatment; more than 90 percent are zoo keepers.

My idea is better than that.

## Renewing the past

SOME believe that the 11 churches in Lalibela, Ethiopia (one is pictured below), were built by the Queen of Sheba. Others believe they were built by a much later Christian monarch. Carved from the living rock, they're considered among the wonders of the ancient world, but they are falling to pieces. So the International Fund for Monuments and the Ethiopian government are repairing them. The churches are also to be treated with a new chemical fluid that preserves stone by preventing moisture absorption. The process may then be used on the pyramids and Easter Island statues.



Liturgical pillars before restoration.



During restoration.



After restoration.



# The Great Wall of Vietnam

*An invisible electronic wall will soon be in use in Vietnam—to monitor a jungle-cleared stretch of land against Vietcong intrusion—if all goes according to plan.*

by John F. Mason

CONSTRUCTION of McNamara's line just south of the demilitarized zone in South Vietnam is under way, despite the defense secretary's defection to his new post as president of the World Bank. Although no one will talk about it, the engineers to build the electronic fence are in Vietnam. The electronic barrier "walls" through the jungle—two, not one—are being cleared; one is just below the demilitarized zone, and a second lies several hundred yards south of it.

Building the fence is a fantastically big job and a very complicated one. It must be made up of an enormous number of very short links of barbed wire, a variety of electronic sensors, explosive mines and other destructive traps, telemetry, communications and a central control. And not only must the complex be integrated; it must also be concealed. The project will cost hundreds of millions of dollars—one estimate goes as far as a billion dollars—depending on how far the fence extends. Maintaining the system will also be a constant task.

McNamara's initial plan was to "bug" a jungle-cleared stretch 15 miles long and two thousand yards wide, but the line will probably then be pushed on to the Laotian border, 30 miles away. It might then go on across Laos, 115 more miles, to the border of Thailand.

Although the Defense Department will not, for obvious reasons, discuss details, many aspects of such a system can be predicted by what is already known of intrusion devices being developed for Special Forces camps and other installations in Vietnam, and by knowing what they will be called on to do.

First, the system must be covert so the enemy can't spot a sensor and slip by it, fool it or destroy it outright. To make the network invisible, the sensors must be small so they can be buried or easily camouflaged. This eliminates big radar that requires a large, unobstructed dish to scan from side to side. The sensors must already be operational, or nearly so, if the three- to six-month deadline is to be met.

The wall will consist of a large number of short, sensor-monitored links because most sensors operate

best with targets at close range, and because small identifiable sectors pinpoint the exact spot where the breakthrough is taking place.

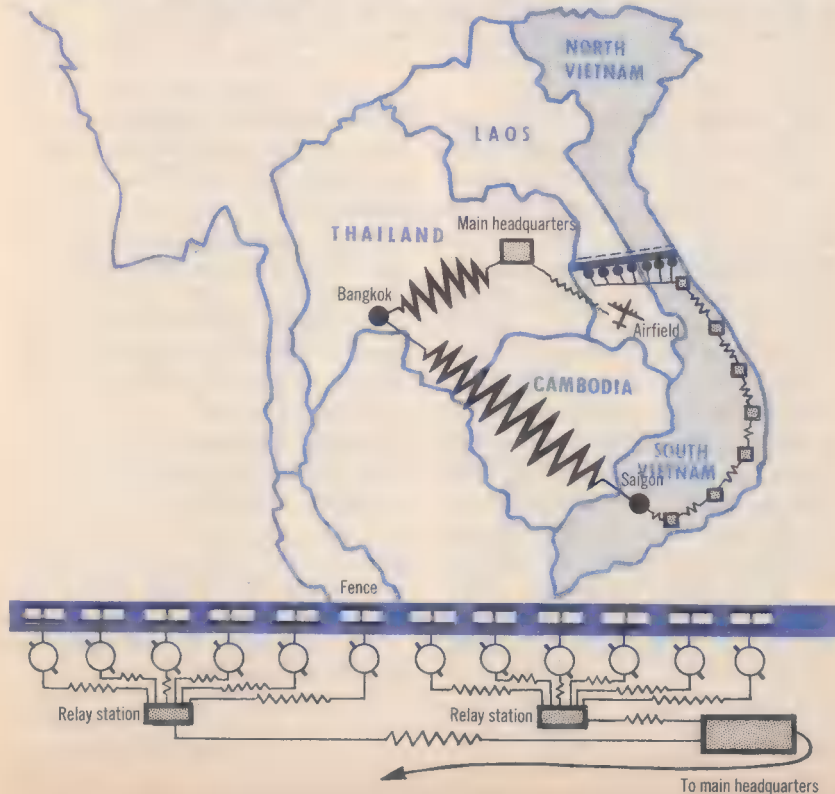
Another obvious specification is to equip each sector with at least two kinds of sensors so a false alarm set off by one device can be ruled out or clarified by the other.

Another requisite is that a variety of sensors be used in a random mix so the discovery and capture of one unit will not knock out

the whole line at the same time.

Each sensor must automatically transmit information to a "detection and control central" and also, in some cases, trigger a mine or some other kind of destructive trap. To do this, a complex telemetry network must be built—covert and secure. Its code must be unbreakable and its signal invulnerable to enemy attempts to jam. To prevent the enemy's tuning in on the same frequency and drowning out the

Map and diagram below show electronic wall and how system will work. Segments of sensors make up fence. Sensor transmits alarm to buoy-like transmitters connected to fence, which send information to relay stations. Relay stations send message to communications network covering South Vietnam and Thailand. (Antennas and cable connect network between Saigon and Bangkok.) Information then goes to main headquarters, where it is evaluated, and instructions are sent to base near the incident.



message with noise, the telemetry transmitter and receiver might be made to change frequencies simultaneously, according to plan, so often that an enemy operator would not be able to keep up.

For the traps, thousands of telemetry receivers will be needed, as well as fuses and servo controls to detonate the explosive on the signal's command.

A battery of displays will be needed in the control central. How complicated they will be depends on a trade-off. If the message is simple—a flashing red light, for example—the investigative procedure will have to be thorough; aircraft will be sent out at all hours of the day and night by stray dogs, wandering water buffalo and strong gusts of wind.

If the information is screened first by computers, however, a lot of trips to the line can be spared. For such a qualitative report, the shortcomings of each sensor must be programmed into the computer with instructions to check one sensor's particular blind spots against information from the other.

Displays for screened information will also be more complicated. Instead of a blinking light for each sector, the information would probably be typed out by the computer, listing the kinds of irregularities that could have caused the reactions of the particular sensors involved.

One detector that is operational, concealable, invisible to the unaided eye and not too expensive, is an active infrared device. A small trans-

mitter emits a highly directional beam of heat to a strategically located receiver. When something blocks the unseen flow, the receiver sounds the alarm.

Unfortunately, the active infrared set cannot distinguish between men and animals; the enemy can see the transmitted beam by scanning the wall with special infrared-detecting binoculars; and if the transmitter is found, a man might crawl under the beam.

A passive infrared system—one that detects sudden changes in heat in an area it is monitoring—would be more secure. It would not have a beam to detect or to crawl under. But whether such a system will be operational in time is not known. The developmental models operate by using two receivers, side by side a few feet apart, both directed toward nearly identical areas in the distance—possibly a clump of bushes. A sudden disparity in heat between the two areas indicates that something has suddenly moved in. If both receivers had noted the same change, the cause would have been a natural phenomenon—rain, the sun's going behind a cloud or coming out again.

Seismic devices might well get into the initial network if the soil is not too sandy and the rock strata are right for conducting faint vibrations. Although seismic systems produce good results, they, too, have problems. An experienced operator is needed to distinguish between animals and men; and low-flying aircraft, especially helicop-



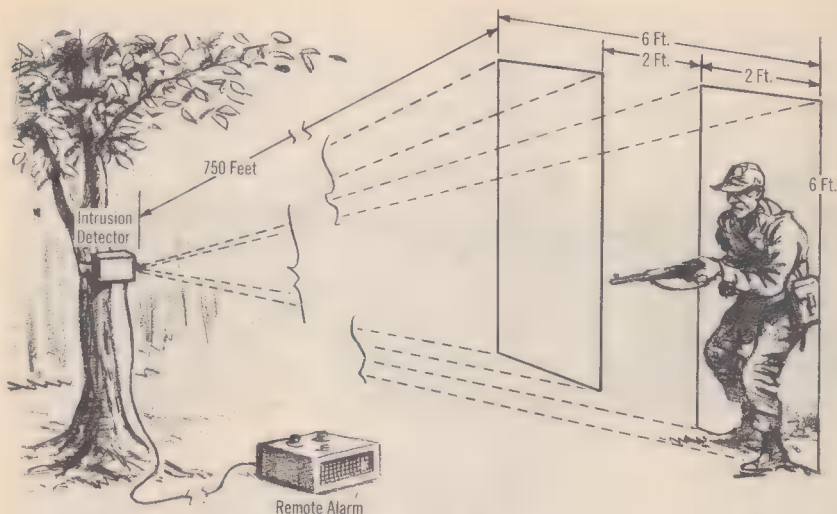


Diagram shows field of vision of infrared intrusion detector (attached to tree) at 750 feet. It has two areas of vision—each two feet wide and six feet high. When moving object crosses path of intrusion detector, remote alarm receives signal from detector.

ters, are capable of drowning out the approach of a fast moving truck.

Another detector, improbable as it may sound, is a buried garden hose filled with water and small transducers. The pressure of someone's foot on the hose is measured by the transducers, converted to electrical signals and transmitted by wire or radio to central control.

An acoustic receiver, built by Westinghouse Electric Corp., might be used in the initial network if the instrument's range can be improved. When tuned to certain ultrasonic frequencies, the delicate electronic ear will pick up the sound of a man brushing past foliage or rustling through weeds.

The most simple minded device—

and it will probably make the grade somewhere in the first 15-mile stretch—is the breakwire detector. As its name suggests, a taut, concealed wire, a few inches above the ground, is broken when someone walks into it, thus setting off an alarm. Its disadvantage is that it must be replaced every time an infiltrator or an animal walks through.

Sensors that must be replaced or repaired will obviously be weak links in the chain. The enemy will sit and learn all he wants by watching American repairmen work.

But these and other problems are ostensibly being worked out. If all goes according to plan, we should see the results of this invisible, 20th century wall very soon.



## Whatever happened to whaling?

*Whaling is still around, but the whale may not be—at least not much longer—unless men's greed, and short-sightedness change quickly.*

by Jeanne Reinert

AMERICANS once knew a lot about whaling. Whaling ships set out from Cape Cod, Nantucket, Boston and San Francisco to cruise the rich whaling grounds that dot the oceans. Whaling had the allure of the Wild West. It was just as hazardous, too. The harpooner stood poised with a slim piece of metal while determined oarsmen — facing the back of the boat — pulled and wondered how close danger lurked. Suddenly the harpoon was thrust! Startled by pain, the great beast

would sound, tugging the tiny "whale catcher" behind it. The wild trip ended when the wounded whale could withstand the pace no longer. Bleeding tons of blood, he would surface and die.

Fortunes came to captains and ship owners who staked their futures on the perils of icy oceans. The whalers brought home barrels of precious oil, rendered from blubber on reeking stoves at sea, to provide lights at night. And the "whalebone" corseted fashionable waists of the 19th century.

Life aboard whaling ships was



K.F.S.

K.F.S.

Whaling in the old days was romantic, picturesque, dangerous and inefficient. A three-year voyage in a wooden ship might result in 40 whales, if the crew was lucky. Only the fabulous prices paid for whale oil made such hazardous voyages profitable.

There is nothing picturesque about modern whaling. It is slaughter on a mass scale. Photo above shows how whale bodies are inflated with air so they can be floated alongside ship to factory ship or land-based station for butchering and processing.

captured in the American epic, *Moby Dick*, by Herman Melville. Exploits of those romantic days in old photos and tales from ships' logs, are preserved in whaling museums in New Bedford, Mass., Mystic, Conn., and on the island of Nantucket. Mementoes abound of the three-year voyages when rugged old salts combed the seas.

Whatever happened to whaling? You never meet professional whalers or order whale steak at your favorite restaurant. You do not buy whale oil by the barrel, and whale-bone stays are out of style. But

whaling is far from dead. In 1966, 51,615 whales were killed, 4,781 less than the year before, as reported to the International Whaling Commission.

The scope of whaling today is not apparent in the U. S. because there is very little American whaling. The museums do not fill in the data from the last 100 years of whaling — years which saw the whaling industry grow into a big business. The most active whaling nations are Japan, U.S.S.R. and Norway.

An idea of the size of whaling





can be garnered from the list of countries who are members of the International Whaling Commission (I.W.C.)—Australia, Canada, Denmark, France, Iceland, Japan, Mexico, the Netherlands, New Zealand, Norway, South Africa, United Kingdom, the U.S.A. and the U.S.S.R. Whaling is also conducted by Brazil, Panama, Chile and Peru.

Whaling today, however, is a far cry from 1868. Melville wrote in *Moby Dick*, "Forty men in one ship hunting the Sperm Whale for 48 months think they have done extremely well, and thank God, if at last they carry home the oil of forty fish."

Compared with today, whaling was in its infancy. According to reported kills, only 30 whales were taken in 1868; in 1878, 116; in 1888, 709; in 1898, 1,993; in 1908,

5,509; in 1918, 9,468; in 1928, 23,593; and in 1938, 54,835. Now the catch, restricted by rules, is about 50,000 whales annually. Clearly, whaling has flourished.

What is this animal of the deep whose capture spurs hunts of this magnitude? Though they are born underwater and live all their lives in the oceans, whales are mammals that, after millions of years on land, returned to water.

Whales breathe air and will drown if submerged too long. Usually, they breathe about every 15 minutes. If wounded, they can remain below the surface for more than an hour. The fabled blowing or spouting is the same type of expiration a person exhales on a wintry day.

In common with other mammals, the whales maintain an elevated,



U.P.I. and K.F.S.

constant temperature. As many whales live in the cold waters of the Antarctic, protection from the cold comes from a thick layer of fat or blubber just under the thin, translucent skin. The blubber also gives the whale a buoyancy so its specific gravity is less than water. Otherwise the whale would sink.

Whales are broadly lumped into two categories, toothed (*Odontoceti*) whales and whalebone (*Mysticeti*) whales, which have no teeth as adults. Toothed whales include the sperm whale, the bottlenose and cachalot.

Whalebone whales are the big ones, the ones with giant plates of fringed, horny whalebone growing from the roof of the mouth.

Despite the ferocious looks of the giant whalebone whales, they don't have teeth and cannot devour so

Harpoon gun (above left), was the invention that revolutionized whaling industry. The gun is mounted on the bow of a whale catcher and loaded with a 200-pound harpoon with a grenade in the head. Gun has a range of 50 to 100 feet. Above: Whale processing at the port of Quintay, Chile. Chile has one of the most active whaling industries, and it does not obey the rules of the International Whaling Commission.

much as a big fish. They live on krill (floating shrimp). They gather great mouthfuls of water and then slush it out through the filter plates. They retain the krill, which they swallow whole.

Whales are the largest animals that ever existed. The largest species, the sulphur-bottom or blue whales of the South Pacific, reach 100 feet and can weigh an estimated 272,000 pounds. An average-size elephant weighs 10,000 pounds.

The largest dinosaurs are believed to have weighed between 30 and 35 tons — only one-third the size of a blue whale.

The second largest species to live is the fin whale, measuring as long as 80 feet. Typically, they are about 60 feet long and weigh about 60 tons, still twice the size of the giant dinosaurs.

What is it about the whale that makes its capture so desirable? The commercial products of whales have varied through the years. At first, whalebone and oil were wanted. Another cherished and fabulously expensive product is ambergris, found only in the intestine of sick sperm whales. It is a perfume base and makes the fragrance persist.

### Commercial market big

Today the commercial products are different. The once sought whalebone is dumped overboard as useless. Most of the whale is salvaged today, though. Meat, blubber and bone are all carefully prepared and stored aboard the ships. The meat is boiled and stored. Meat and bone are sometimes ground up and used as feed for livestock and poultry. A major use of whale is in margarine. It is used in some drugs and fertilizer. During World War II, whale oil was used in explosives.

Whale hunting today is a creature of technology. The turning point came in 1868, with the invention of the harpoon gun by Svend Foyn, a Norwegian. After years of

experimentations, Foyn perfected a combination of harpoon gun with a grenade in the head. Steam driven ships and power tools gave the industry further effectiveness.

Whales are hunted from whale catchers — small boats about the size of one-cabin motor boats. Today they are equipped with radar and radio contact with the factory or mother ship. On the front of the catcher is its harpoon gun. Each gun has a pistol grip, mounted on a swivel. A 200-pound harpoon, with a grenade attached to its head, is loaded in the gun. The gun's range is 50 to 100 feet. Today's catchers are equipped with air pumps. With these the whales are kept afloat after death. A puncture is made in the whale's stomach and thousands of cubic feet of air are pumped in.

Catchers are usually attached to factory ships, well described by R. B. Robertson in "Of Whales and Men":

"Imagine two large oil tankers stuck together beam to beam, so that their funnels are abeam, and not fore and aft. Place the two in an immense blunt-bowed hull, with a wide, shallow draft and a freeboard of prodigious height. Then cut off the stern of this Siamese ship, carve a great obscene-looking hole where the sternpost was, and run a tunnel that could accommodate two railway trains from the waterline between the two screws at a gently sloping angle up to the main deck, just forward of the funnels . . . in her superstructure, a



*The International Whaling Commission was formed after World War II to save the whale from extinction.*

factory ship is divided in two—the reason being that two vast areas of deck space, each capable of accommodating two or more 90-foot whale carcasses, must be left clear in the middle of the ship; below this clear space is the factory, a maze of machinery occupying three decks and a floor space measurable in acres; and below that again are the tanks, capable of accommodating 20,000 tons or more of oil, and reaching down to the bilges.” And the ship sleeps 700 men for the eight-month sojourn to South Georgia in the Antarctic.

The factory ship is a mammoth butcher block. Steam-powered winches have made possible processing of whales on board.

Whales are also processed at land stations. These have the same equipment as factory ships to turn carcasses into poultry feed and oil. Some whale catchers drag whales to stations. In the southern hemisphere, stations are located in Australia, Brazil, Chile, New Zealand, Peru, South Africa and South Georgia in the Antarctic.

It takes only 40 minutes to dispose of a whale carcass. This is lightning fast considering a blue whale's jawbone weighs two tons; the backbone, 10 tons; the skull, 4½ tons; the liver, one ton; the blood, eight tons; the meat, 56 tons; the tongue, three tons; the heart, one-half ton; and the blub-

ber, 26 tons. Each whale was worth about \$5,000 in 1955, according to Robertson, and one expedition would carry home six million dollars worth of whales.

After whaling reached dizzying dimensions in the late 30s and humpback whales were virtually exterminated through overhunting, World War II interfered and most whaling vessels were converted to military use. When whaling resumed, the International Whaling Commission came into being to regulate whaling. The I.W.C. laid down rules, hopefully to stave off extinction of whales.

I.W.C.'s main mission is to decide how many whales can be killed per season. I.W.C. conducts and coordinates studies to gauge the size of each species. No one knows what the lifespan of a large whale is nor how often whales reproduce.

One study tried to combine age and migration details. Small darts are marked with the location and the date, then shot into a whale. Hopefully, the dart can be retrieved when the whale is killed, and the information compared with the place of killing. In practice, however, some whalers efficiently collect the darts; some don't. Machinery sometimes mangles the darts until they are unreadable. During the 1965 and '66 seasons, 287 whales were marked in the southern hemisphere and 303 in the

Scene on the cutting deck of a factory ship. Men called flensers, working with long-handled knives, strip the blubber from the carcass. After blubber is removed, the remains are cut into slabs and pressure cooked down into whale oil on board ship.

northern. How many darts were recovered? In the north, 48 darts and in the south, 12. Altogether, 1,456 whales were marked from 1953-63 and 309 darts returned.

The I.W.C. also sets minimum length requirements for each whale species. Sei whales must be 40 feet long, sperm whales, 38, and fin whales, 55.

All of the I.W.C. rules are practical and specific guides for whalers. Each year the I.W.C. sets limits on the number of Blue Whale Units that can be captured. Limits are based on estimates by a scientific committee of three of how much depletion the whale stocks can survive. A Blue Whale Unit (B.W.U.) equals one blue whale in size. Thus one B.W.U. equals two fin whales, two and a half humpbacks or six sei whales. In 1966-67 the B.W.U. limit was 3,500; in 1965, the quota was 4,000. Close tabs are kept on each ship's take during the final part of the season and all ships must cease whaling on a specified date as the B.W.U. limit is approached.

Each regulation of the I.W.C. requires unanimous agreement by all countries. Any member country may object to a proposed regulation, and it is void. This includes the annual B.W.U. quota. A quota



could not be agreed to in 1964. As a result, 7,065 B.W.U. of whales were slaughtered. Just as in any cooperative venture, the I.W.C. works when members cooperate. But the I.W.C. does not have the teeth to impose rules.

No country can be coerced to join the I.W.C. If whalers in a non-member country flaunt regulations, the I.W.C. can only plead with them. In 1966, the I.W.C. appealed to Chile and Peru to adhere to the minimum lengths for sperm whales captured. Last year, Norman Buchan opened the I.W.C. session on a foreboding note: "The figures



of declining catches speak for themselves," he said. "If the whale is to be preserved for future generations as a valuable source of protein, indeed, if the whaling industry itself is to survive, drastic and effective measures have become urgent."

Though declining, the number of whales taken in the Antarctic last year was still formidable: 2,893 fin whales and 12,368 sei whales, plus 4,960 sperm whales. Outside the Antarctic, 24 land stations and seven factory ships took 29,536 whales. Steaming to and from the Antarctic, 10 expeditions caught another 1,934 sperm whales.

An analysis of the 1965-66 catch by the Food and Agriculture Organization of the United Nations reports, "The most striking feature of the 1965-66 catches is the drastic reduction in the fin whale catches, to less than a third of the previous season, and less than a tenth of the average annual catches in the 1950s. The sei whale catch also fell slightly." Why the drop in fin whales? The clear implication is that the fin whale is overhunted and headed toward extinction. Best estimates of the fin whale population in 1966 was only 37,700. Any catch over 4,500 fin whales per year



would further deplete the stock.

"The Insupportable Overkill of Whales" is the title of a bitter indictment of whalers by Arthur Bourne, World Wildlife Fund observer to the I.W.C. Explaining how a three-man committee recommended the quota, Bourne says: "But the scientists failed to persuade the industry at the 1964 meeting, and in the next season a free-for-all ensued. Even the industry was shocked, and in 1965 agreement was reached on a quota of 4,000 B.W.U., which was above the

scientists' recommendation. Last year the quota was brought down to 3,500 B.W.U. — still much too high. It is a sad indictment of the whaling nations that they will only listen to sensible solutions when economic disaster forces them to.

"Maybe now, at long last, and at the expense of the blue, the humpback and probably the fin whale, the nations concerned will call a halt to the overkilling, not only in the Antarctic, but also in the North Pacific," he concludes sadly.

## Whales—going, going . . .

The blue whale is almost gone; the humpback whale is going; so is the fin whale. Conservation of whales has few champions. Everyone can see a redwood tree or an eagle, but few of us ever expect to see a whale.

"There are about eight species of large whales which have been heavily pursued at one time or another by man. The industry now concentrates almost exclusively on fin, sei and sperm. All of the others have been hunted nearly to the point of extinction. Whalers have acquired, often justifiably, a reputation for ruthlessness and unrelenting greed, and many people even question the very concept of hunting whales," commented Jon Lindbergh in a recent *Life* article.

If any group wants to preserve whales, it should be the I.W.C., which has existed since 1948. What

has happened to the whales during that time?

Blue whales numbered 100,000 in 1938 and at least 12,000 in 1953-54. Today's best estimate is about 600. Six hundred is such a small number that it is unlikely enough blue whales will find one another to keep the species alive. Complete protection by the I.W.C. was not agreed upon until last year. As if the tardiness of the I.W.C. were not enough for the blue whale's demise, whalers in Chile caught 371 blue whales, and a third whaling station, besides Chile's two stations, may have been used, but catches not reported. During the 1965-66 season, the two stations reported taking 125 blue whales. Since Chile is not an I.W.C. member, it cannot be coerced to obey the rules. The blue whale is almost gone.

Fin whales no longer abound.

Estimates in 1965 gave a population between 17 and 28,000 whales. In the late 1950s, they numbered about 120,000. It's not too late to save the fin whales. One proposal before the I.W.C. argues in favor of excluding fin whales from catches for 15 years, thus letting the stock build. The backers of this plan say the total annual worth of whaling would double. But to act on such a plan would take long-range vision. The whaling industry has never been noted for that!

To add to the whale's plight, current information on whales and whaling is hard to find. Most of it is fragmentary, disjointed.

Much of the available information on whaling comes from the annual report of the I.W.C. Annual reports of all types have their pitfalls. They have been described as a "special form of fiction." For an outsider, it is impossible to tell how accurately the official report of the I.W.C. reflects what goes on. Are the nations in agreement or does ferocious dissent occur? Are whalers a strong lobby, able to impose their desires on the I.W.C.? Do the reports try to hide or to reveal problem areas? Under a discussion of sperm whales the 1966 report says, "Moreover, while the minimum size limit — 38 feet—should be enough to save the great majority of females, massive evidence was available to the commission to show that this regulation was being broken on a large scale." Are many rules so ignored?

Another item in the I.W.C. re-

port is the size of the budget. The working budget in 1966 was a mere \$16,660 a year with \$5,269.60 allotted to stock assessment studies and cost of data processing.

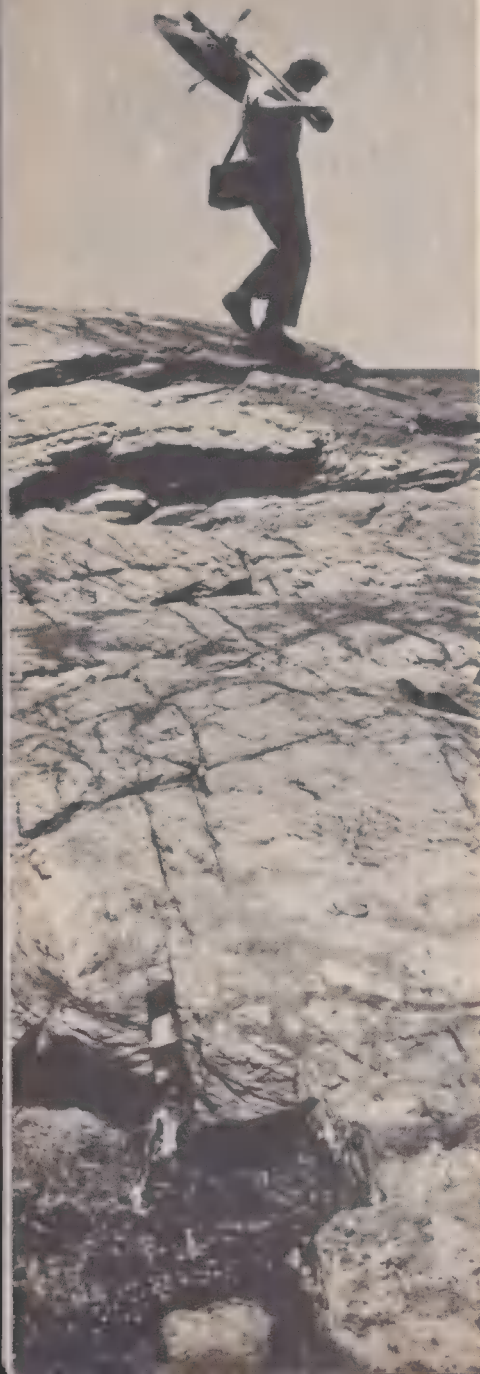
If whales cannot be saved for future generations because of their size and intrinsic interest, surely they can be conserved as a source of food. In a world facing a population crisis and crying for more sources of protein, can whale meat be ignored?

### One whale—10 tons of steak

About 10 tons of steak come from a medium-sized fin whale. If 30,000 whales could be harvested annually, that would be 600,000,000 pounds of meat. A well-balanced protein diet includes 100 pounds of meat per person per year. Whales could therefore meet the meat needs of six million people a year. There is a big market for fin whale steak in Scandinavian countries. Can we afford to lose the whales today?

There may be some unique uses today for whale products. However, if these needs exist, they are not clearly on record. Mineral oils can replace the uses of whale oil, other fertilizers are known, other poultry feeds are made.

Must whales be used to feed chickens or enrich peach trees? Can't they be allowed to populate the oceans with whales for another generation? Yet, who will complain before it is too late? Going, going . . . good-bye whales.



# Recording

by Barbara O'Connell

**S**QUAWK! Honk! Bang-bang-bang!

It's an ordinary-looking record, but the noises coming out of it are neither melodious nor meaningful to the average listener. Sometimes it sounds like a man hammering a nail, other times like a finger running down a comb. A few of the noises are a little more familiar, though—like that low croak. Isn't that a bullfrog?

It is. All the sounds are frog calls, in fact, taped in the field and incorporated into one long-playing disc available from Folkways Records under the title *Sounds of North American Frogs*. Along with the record, you get a commentary by a herpetologist and an illustrated booklet that gives you a look at the noise makers.

Frogs are just one of the animals you can hear in your living room today. Record companies are offering the sounds of fish, aquatic mammals, zoo animals, farm animals, swamp animals, jungle animals, insects and a whole aviary of birds. There's an entire record devoted to the song sparrow and

Providence Journal-Bulletin

Carrying tape recorder and sound reflector, Peter Kilham sets out to tape bird calls along shore. His equipment is so sensitive it picks up high notes humans can't hear. Notes are lowered for record.

Science Digest—April, 1968



# animal sounds

another that concentrates on the mockingbird. Some discs feature a particular locality: the Amazon River, a Maryland farm, a South African homestead.

And if you want more specialized calls, sound-effects records provide the voices of excited hens, frightened ducks, angry dogs and growling elephants.

How do you get the sound of a growling elephant or a creaking frog on a record? Surprisingly, the calls of the more exotic animals are often easier to get than the calls of familiar frogs, birds and insects. Many exotic animals are caged in zoos, but it's hard to find the right frog in a swamp at night.

Just getting to the frogs he tapes is one of the hardest parts of the job for Dr. Charles M. Bogart, the American Museum of Natural History herpetologist who recorded *Sounds of North American Frogs*. In quest of frog voices—there are over 50 on the record—he has fallen in water holes up to his waist, lost his way for hours and been almost devoured by mosquitoes. The hazards are inevitable: frogs sound off at night after heavy rains and do most of their calling in the breeding season, which corresponds to the rainy season in the tropics.

Another hazard of the job for field recorders is suspicious sheriffs. "The law wonders what I'm doing out there in the woods with all

that equipment," says Dr. Bogart, who totes a portable tape recorder, a microphone and a sound reflector — standard gear for recording sounds in the field.

Once, in New Jersey, he was recording a call when the sound of a motorcycle suddenly marred the tape. The officer aboard the cycle demanded Dr. Bogart's business and then, mollified by his explanation, promised to tell his fellow officers to leave the scientist in peace. Dr. Bogart started the recorder again but before long a police car roared up to tell him that the frogs were really in voice at another site.

"The tape was ruined again, of course," he reports.

Ruined tapes are a minor problem, though, compared to what happened to a colleague of Dr. Bogart's. Recording frog calls in Guatemala, he came across a couple of Indians. What was he doing? "Why, hunting for frogs," responded the herpetologist. The answer, unfortunately, was the local equivalent of a well-known American insult. The Indians attacked with machetes and the scientist had to drive them off with dust shot.

Once a frog is located, taping the call is usually fairly easy. "After a good rain, it's hard to make them stop calling," says Dr. Bogart. If a frog won't sound off, the herpetologist may encourage him with a call of his own. "It doesn't take a good

call," he notes. "They'll start calling even when you speak."

Dr. Bogart has one problem not faced by other recorders of animal sounds. He has to catch his subjects. "How else can you be sure which frog is calling?" he asks. "It might even be an insect—some frogs sound like insects."

Although Peter Kilham of Droll Yankees Records doesn't have to catch the birds he records, he undergoes considerable discomfort tracking them down. Usually he visits a likely site a number of times in advance to check on the birds, then returns at 2 or 3 a.m. with his equipment to await the dawn. More often than not, it's wet under foot because, as Kilham explains, "birds sing in mud time."

In spite of his reconnoitering, the recording trips always turn up a few surprises, according to Kilham. "It's like fishing—you catch a lot of things you don't expect to." The most valuable sounds, he thinks, come "totally by surprise."

It may take Kilham three or four years to get enough bird sounds to make a long-playing record with a definite theme. Once the sounds are assembled, he edits them carefully. With bird sounds, editing is a bit tricky. Some bird songs have notes so high that the listener can't hear them at all; the sensitive tape recorder, however, catches them. To make these sounds audible on the record, Kilham converts the high notes to lower ones.

"People can hear more on one of my records than they would if

they were in the woods themselves," he points out.

Kilham concentrates on birds for Droll Yankees, but he's also taped the sounds of frogs, foxes, beavers and flies, as well as a whole farm of animals for *The Farm*. The hardest sound to get on the farm wasn't an animal—creatures were comparatively easy—but the sound of milking cows by hand.

"Everyone milks by machine, now," sadly notes Kilham, who likes the old way of doing things. He subtitles his records "The Voice of Old New England."

Finding animals to record was no problem for Arthur Greenhall of the U.S. Fish and Wildlife Service, who taped the zoo sounds for Folkways' *Sounds of Animals, Zoo and Farm*. The creatures were right under his nose at the Detroit Zoo, where he was a curator at the time. There were plenty of other difficulties, though.

"A couple of animals were hard to record," he says. "I think the animal that took me the longest time to tape—16 hours—was the ostrich. I knew the tape ran for a half hour, so I set up the recorder in front of the bird and went away. I came back every half hour and checked the tape to see if there was anything on it."

After 32 trips back and forth, he found the ostrich had emitted its peculiar call which sounds, according to Greenhall, "like lions roaring in the distance."

Another uncooperative beast was the zebra. "It has a jackassy sort



American Museum of Natural History

Dish-shaped reflector being set up by Dr. Charles M. Bogart concentrates sound for recorder. Total gear weighs less than 10 pounds; it used to take two men to tote it.

of voice, but all I could get from it was one call. So I played that back to him and he responded."

This response to an animal's own call is a territorial call, given to warn an animal away from another's territory. Dr. Bogart elicited the same response from frogs. Sometimes an animal does more than call when he thinks there is an intruder on his home ground. When Greenhall played the taped call of a wapiti—a large elk—back to him, the animal, who had his harem of females with him, came galloping down toward the sound and hit the wall of the enclosure with a bang. Luckily, Greenhall and the recording equipment were on the other side of the wall.

Equipment can even produce an animal noise without the animal being present. A technician at Thomas J. Valentino, Inc., of New York City, one of the oldest sound-effects firms in the business, came up with a fake zebra call and an electronic bee recently. To make the zebra call, he "fooled around" with the sound of another equine that was already on tape, until the sound approximated that of a zebra. How did he know what a zebra sounded like? "I heard it on television."

Sometimes, according to Frank Valentino, son of the founder of the firm, customers won't accept a real noise when they hear it. "People think of sounds differently than

they are," he explains. "They say, 'That's not it,' when we play a real animal sound for them. Then we fake one, or substitute another animal."

Usually, however, young Valentino and sound technician Chris Carrino tape sounds on the spot at zoos, pet shops and animal farms. "We got a locust in Central Park and squirrels in my back yard," says Frank. "The hardest part is waiting for them to make a noise."

Valentino issues a series of sound-effects records, including, on one disc, such diverse noises as a guided missile, children at a swimming pool and a screaming chimpanzee. Most of the sounds last less than a minute. Records like these are primarily designed, Frank Valentino says, to provide background noises for producers of plays, musical records and independent films.

### Who buys the records?

But who buys the sounds of frogs, birds, zoo animals and the menagerie of other animal noises now on record?

Record companies report that while producers of plays and films are among their best customers, the records sell to a variety of people. "City parents buy *The Farm* for their children, to let them hear how farm animals sound," says an employee at G. Schirmer, Inc., New York, which offers a large selection of animal noises. Moses Ashe, an executive of Folkways Records,

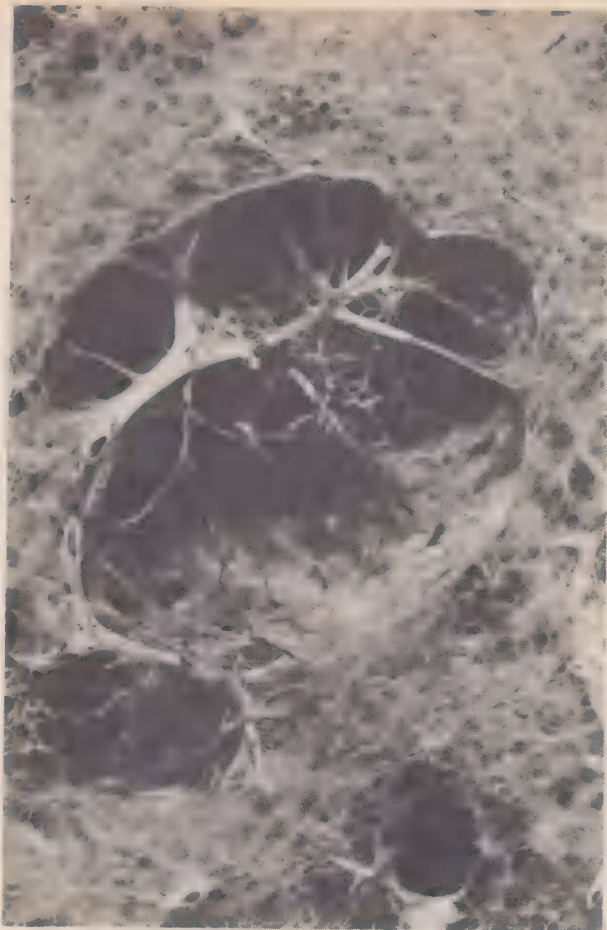
claims that "professional people" buy animal records to get away from it all. Bird watchers purchase bird discs—far more of which are available than any other animal record—to help them identify birds. Instructors who teach zoology courses buy a record like *Sounds of North American Frogs* to use in class.

"Elementary schools use our records to stimulate the students to write themes or draw pictures," says Peter Kilham. "They even send us the pictures." For some reason, he adds, his records sell best in California, Michigan, Wisconsin and a few of the southern states. "New York," he reports, "is deadly for animal sounds."

But there are reasons for buying animal records even in New York. "Some people here want dog sounds on tape," says Frank Valentino. "An electric starter sets off the record in their home and it makes burglars think there's a dog there." Naturally, he adds, these customers choose "large dog" sounds over "small dog" sounds, both of which the company lists in its catalog.

And then there was the girl in Greenwich Village who bought *Sounds of North American Frogs* and *Sounds of a Tropical Rain Forest in South America* to annoy her noisy neighbors. After she played them at full blast one night on the window sill, an unnatural hush settled over the lively neighborhood. A couple of weeks later, her record player was stolen. They left the records, though.





## Common sense about emphysema

*Lung tissue damaged by emphysema is not a pleasant sight, but a doctor's explanation of the disease shows that while it can be a serious disorder, it often is not, and many people live with it quite tolerably for many years.*

by Joseph D. Wassersug, M.D.

So much has already been written about emphysema, why another article? The answer is simple. Much of the writing has been generalized inaccuracy. Some articles that have appeared are the hysterical exhortations of public relations men eager to get more of your charity dollar, or subtly urging you to buy air filters and purifiers for your home. Admittedly, emphysema is a serious disorder in many cases, but it is not *always* the "choking," "suffocating" disease that some frantic authors paint it.

Emphysema occurs when you are able to get more air into your lungs than you can easily get out. When a person has emphysema, he may be able to breathe in easily enough, but expiration, or breathing out, is usually forced and prolonged. We can understand emphysema best if we first take a look at the normal anatomy of the lungs. First, there are the bronchial tubes. The airway starts with the nostrils and the mouth. Both lead into a windpipe, and a larynx (voice box), which in turn sits at the top of the windpipe. The windpipe (trachea) divides into a left and right main bronchus. These bronchi, right and left, divide again into branches called conducting bronchioles. These, in turn, divide further into tiny respiratory bronchioles, which lead ultimately into the air sacs, where the oxygen of the air is absorbed by the blood, and the carbon dioxide of the blood is picked up to be exhaled.

The main mechanical force behind respiration is the diaphragm, lying just below the lungs. It acts as a tough rubbery piston that sucks in air every time it contracts and pulls down. As the diaphragm relaxes, air is forced out of the lungs.

Helping the diaphragm in the mechanics of breathing are the intercostal muscles, which lie between the ribs, and the accessory muscles of respiration, which are attached from the neck to the upper ribs. If the diaphragm is weak or functioning poorly, these accessory muscles work hardest. While inspiration, or breathing in, is due to the very definite active contraction of muscles, expiration is largely the result of the so-called passive recoil of the chest and diaphragm. It is as if one repeatedly stretched a rubber band and then let it go. In the normal anatomy, the chest is usually two-and-a-half to three times longer from side to side than it is from front to back.

### Respiration hard to test

There is a chemical and physiological "drive" to respiration as well as a mechanical one. Basically, the function of respiration is to get the oxygen into the blood and to drive the carbon dioxide out. This process, however, is so complicated that doctors do not have any one single test that can measure the efficiency of respiratory function.

To know exactly how effective the respiratory process is in any

*Air pollution is a cause of emphysema, and most persons with the disease are heavy cigarette smokers.*

given patient, doctors may have to measure the acidity of arterial blood, the amount of carbon dioxide in the expired air, the speed of air flow in quiet and forced breathing. Figures often obtained may have to be compared with average standards and corrected or adjusted for the patient's age, size and sex. When many careful blood and gas measurements are made, the doctor may then have a fairly good idea as to what degree the patient's lung function has been damaged by the emphysema.

The doctor cannot always tell from a physical examination whether the patient has emphysema or not. The ordinary X ray of the chest is not always a sure guide as to the discovery of emphysema. By fluoroscopic the chest and watching the motions of the diaphragm, the doctor's diagnostic accuracy of emphysema is increased. By making certain breathing tests and blood examinations, the diagnostic accuracy is further increased.

Lung function can be damaged in many ways. The damage can be local, covering only a relatively small area of lung tissue. This may happen, for example, when pneumonia has failed to heal completely, or when there are scars from an old healed tuberculous process. In emphysema, more often than not, there is less likely to be localized damage to the lungs. Instead, the

damage is more widespread.

Chronic infection, such as bronchitis or bronchopneumonia, may produce long-standing and destructive changes in the lungs. Enlarged glands in the chest may press on the bronchial tubes. Harmful dusts in the atmosphere and some dusty occupations are especially important. Air pollution is a cause of emphysema. Most persons with severe emphysema are heavy smokers of cigarettes.

### **Large lungs, low efficiency**

In emphysema, several things happen. The diaphragm becomes depressed and flattened out, the chest enlarges from front to back, the accessory muscles in the neck pull harder and raise the upper ribs and the collarbone. The result of all this is that the lung volume increases and the chest takes on a barrel-shaped appearance. Microscopically, the walls of the air sac become disrupted so that each air sac becomes larger, while the total number of air sacs in the lungs diminishes. Decreasing the number of air sacs lowers the efficiency of gas exchange between the lungs and the blood stream. In other words, although the lungs become larger in emphysema, they function less effectively.

Although X rays may provide a clue as to the presence of emphy-

sema, X rays of the chest by themselves are usually not too helpful or diagnostic. The size of a person's chest will vary not only with his height and weight, but also with his age, his athletic ability, physical fitness and even whether he plays a wind instrument.

Let me repeat, emphysema may be a serious disease of the lungs causing progressive disability and death. On the other hand, there are many old people around with mild cases of emphysema who will outlive their emphysema and die of other causes. For them the emphysema may be a mild disease, more an annoyance than a disability.

### **An early start**

It is likely that emphysema starts rather early in life, following repeated respiratory infections. For this reason I believe that whenever possible, lung infections should be treated intensively using antibiotics to destroy all the invading germs as soon as possible and as thoroughly as possible. Infections in the lungs that are allowed to continue unchecked lead to progressive damage and disability. There is only a short and hazy border between chronic bronchitis and emphysema.

Two factors, chronic lung infections and smoking tobacco, are most important in the causation of emphysema. By eliminating these two factors, most cases of emphysema could be prevented and would not develop later in life.

Treatment of emphysema begins

by urging the patient to give up smoking and by encouraging him to live in as dust-free an atmosphere as he can reasonably do. Since many cases of emphysema are accompanied by chronic bronchitis, with cough, phlegm and tenacious sputum, treatment with antibiotics is usually advisable.

Emphysema is also accompanied by considerable scarring of the lungs and weakening of the bronchial tubes. Both the scarring and the allergy reaction in the lungs can be depressed by corticosteroids. Most doctors start with large doses of such steroids and then gradually reduce the dose as the patient shows improvement. In some cases the steroids can be discontinued after awhile, but in others, the patients seem to do better if they are continued at a maintenance level. Since the steroids do have side effects (particularly, they upset the stomach and may cause ulcers), patients who are receiving this medication should be under close medical supervision.

To open the bronchial tubes and make the air passages wider, doctors use a variety of bronchodilator drugs such as ephedrine, epinephrine, aminophyllin and isoproterenol.

In emphysema the heart, especially the right side, may become strained because of the resistance it encounters in pumping blood through the lungs. If there is any evidence of heart failure of this type, the doctor may want to use digitalis to strengthen the heart



*Since medications for emphysema are often potent, supervision of their use should be followed closely.*

and to increase its effectiveness. Because digitalis is a potent drug, its use may be dangerous. Any patients, especially emphysema sufferers, who are taking digitalis should be under close medical observation to make sure that the dosage of the drug is adjusted carefully for their personal needs. Diuretics, or "fluid pills," are also useful in some cases and, since they are potent, their dosage, too, needs medical supervision.

Oxygen must also be used wisely. A patient with advanced emphysema cannot tolerate a high concentration of oxygen because an atmosphere that is too rich in oxygen may knock out a breathing center in the brain on which the patient is dependent. It is best, therefore, to start with small amounts of oxygen and then increase the dosage.

To improve breathing still further, the doctor may want to use various medications in an aerosol form. Such aerosols can be "driven" by compressed air, compressed oxygen, a bicycle tire pump, a motor compressor or a variety of other devices capable of compressing and delivering air that is laden with moisture and chemicals. Moisture is important because the bronchial tubes are usually dry in emphysema. Tenacious phlegm can be thinned out by aerosols that decrease the sputum's viscosity. Bron-

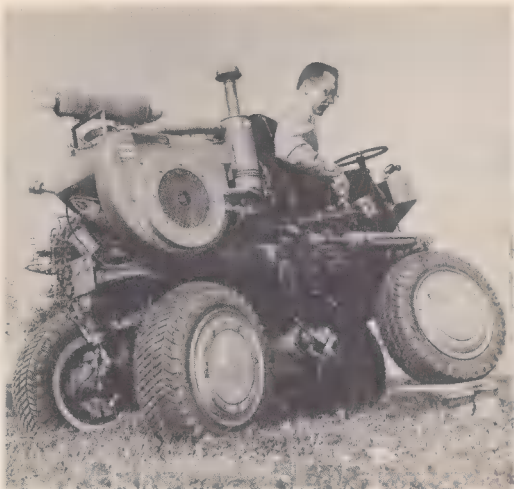
chial tubes can be dilated by epinephrine or isoproterenol. Antibiotics are usually not administered by aerosol nowadays because they are generally too irritating.

While some of the devices for creating aerosols (such as ultrasonic devices) may require a hospital setting, there are many other nebulizers that can be held in hand to deliver an effective spray. Since many contain rather large amounts of epinephrine or isoproterenol, they must be used cautiously.

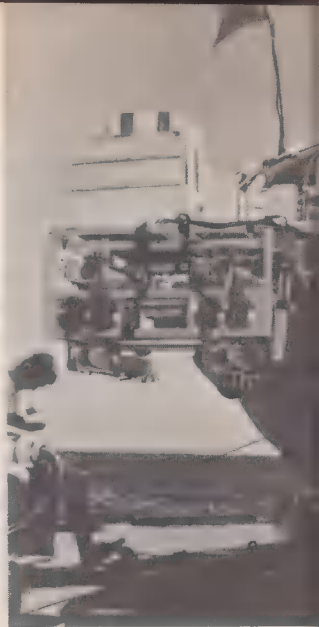
### **Rule 1: don't panic**

What should you do if your doctor tells you that you have emphysema. First, don't panic. It is not necessarily a suffocating disease, a crippling disease or a disabling disease. Secondly, you might ask whether the diagnosis of emphysema has been made on X ray grounds, on physical examination or on the basis of pulmonary function tests. A diagnosis of emphysema based on a single X ray of the chest is doubtful. Finally, the person who is told he has emphysema should ask how severe it is. The mild cases can often get by for many years with little or no trouble, and many of the severe cases can continue without too much disability for the remainder of their lives. With medical help, most patients get along fairly well.

## NEW FOR INDUSTRY

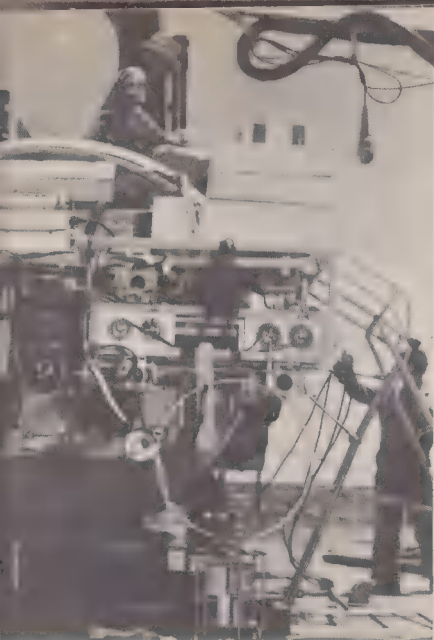


This one-man hydraulic plow buries telephone wire 18 to 24 inches below the ground, leaving landscaping relatively undisturbed. Vibrating plowshare, pivoted about center of wheelbase, is kept on course by power steering. Bell Telephone Laboratories, Chester, N.J.



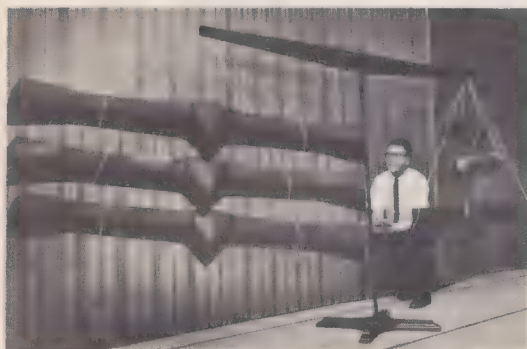
Deep Quest is the name of this shark-shaped submersible. It marks the first use of maraging steel (in the twin sphere pressure hull) in such a deep submersible. The outer hull is aluminum. The 50-ton craft can go to 8,000 foot depths, carrying payloads up to 7,000 pounds, plus four men. Lockheed Missiles and Space Co., Burbank, Calif.





This close-up of the instrument package attached to DEEPSTAR-4000 shows the vast amount of scientific equipment being used to study the ocean's floor. It's all part of the U.S. Navy's four-phase oceanographic research program.

New Road Roughness Indicator tells how rough or smooth road surface is and potential maintenance problems. Modifications in instrumentation have been made and new style truck carries equipment. Soiltest, Inc., 2205 Lee St., Evanston, Illinois.



A glass-reinforced thermoplastic sheet, called Azdel, has been developed jointly by PPG Industries and Union Carbide. Its light weight is illustrated. Three Azdel parts balance die castings that, when assembled, form one equivalent part. Weight, impact strength, corrosion resistance, make it promising for automotive industry,



Library network of Bell Telephone Laboratories in New Jersey has been computerized for loan system. Computer miles away records transaction at input terminal, or information is sent using keyboard. Card reading unit in front.



This extremely long train (500 cars) has been made possible by remote control equipment called Locotrol. (Most trains have only 200 cars.) Three diesel units in front, three "slave" units (radio-controlled) about 300 cars back, power train. Two-way radio transmits information from lead locomotive to slave. Radiation Inc., Melbourne, Fla.



## Organ transplants: A legal and

by Edward Pesin, Esq., and  
Ruth Winter

**C**AN a doctor who performs a heart transplantation be brought to trial as a murderer?

If a man received a brain transplant and then committed a crime, would he really be guilty?

Before the lawyers and the courts can answer such questions, they must first determine legally when a patient is dead.

Not too long ago, a patient was pronounced dead when his heart stopped beating. Today, this is called "cardiac arrest," and quite frequently can be reversed.

Once a patient was also considered dead if he stopped breathing. Now this is merely a symptom which can be cured by a machine called a respirator.

Many people are now walking around, leading useful lives, who would have once been given up for dead after a heart stoppage or respiratory arrest. But, too, many who have had these symptoms are not walking around. They are either

dead or vegetating and sapping the services of needed hospital equipment and personnel. They are also draining the emotions and the finances of their families.

How do doctors know when a patient will completely recover from "clinical death?" How do they know when death is imminent?

They don't. They can only give an educated guess.

Dr. Henry K. Beecher, Dorr professor of research in anesthesiology at Harvard, recently asked the questions: "When, if ever, and under what circumstances is it right to use for transplantation the tissues and organs of a hopelessly unconscious patient?"

"Can society afford to discard the tissues and organs of the hopelessly unconscious patient when they could be used to restore the otherwise hopelessly ill but salvageable individual?"

Heart disease now kills more than 500,000 persons a year in the United States. Morally and philosophically it might be right to take the organs of a dying person to



All Photos U.P.I.

Members of the medical team which performed America's first adult cardiac transplant at Palo Alto-Stanford Hospital in California, photographed during that historic operation. In the operation, steel worker Mike Kasperak received the heart of donor Mrs. Virginia Mae White. Surgical leader was Dr. Norman E. Shumway (head down just over hypodermic).

## moral dilemma

save the life of another. Legally, if the patient is not dead, it is murder. Which brings us back again to the definition of death.

Many physicians now believe the criterion for death should be the cessation of brain function as indicated by an absence of waves in the electroencephalogram, which records the brain's electrical activity. Some say the patient may be pronounced dead immediately. Others say a wait of 48 hours should be required since no one knows for sure whether the brain, like the heart, could be restarted. But a wait—even for the short time it takes to summon the technician and the EEG machine from another part of the hospital and to hook up the electrodes to the skull, may be too long.

In the first South African heart transplant case where the heart of a 25-year-old girl was implanted in the body of a middle-aged man, the girl's heart had been taken from her body and perfused with cooled blood for three hours while the man's chest was prepared to

receive it. As a result, the girl's heart had suffered damage from lack of oxygen. It worked well enough to keep the recipient alive after it was implanted, but the ultimate effect of the damage is still unknown.

A committee to determine when a patient is legally dead might be formed. But calling the committee together would take time, and there is little time when a heart or a brain or any other vital organ of the human body is needed for transplantation.

There is no doubt that the doctors who perform heart transplantations today and who will perform brain transplantations tomorrow are treading on new and dangerous grounds.

If the heart has stopped beating, but the brain waves show the patient is still alive, then it could be considered murder to remove the heart. If it is the brain which is needed and a doctor must wait until the brain's electrical activity has stopped, it would be worthless.

Even if the patient had been conscious and stated in writing that he wished to donate his brain or heart, it would be against the law to remove these organs before death. No one can legally consent to an act, the consequences of which would be certain death.

If the patient is in coma with no

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Edward Pesin is a practicing lawyer and a graduate of Harvard Law School. Ruth Winter is a professional science writer.

## Heart transplant recipients and donors



Louis Washkansky received heart of 25-year-old Denise Darvall, killed in auto accident.



Mike Kasperak got heart of Mrs. Virginia Mae White, who died of brain hemorrhage.



Dr. Philip Blaiberg got heart of 24-year-old Clive Haupt, who died of brain hemorrhage.

chance of recovery, the doctor has no right to take any of the patient's organs before death is declared. If

he does, it could be considered euthanasia. It is a doctor's legal duty to do everything within his

power to keep the patient alive.

But what about the recipient? The patient who receives the heart transplant also presents a legal problem. If his own heart is removed in preparation for the transplant and the transplant fails, would the doctor who removed the patient's own beating heart be guilty of murder?

In order to protect himself legally, the doctor might have to determine exactly how long the patient would live if he didn't have the transplant. Suppose it were one month? If the patient then died on the table during the transplant or two weeks later, wouldn't his life have been shortened by the operation?

This type of operation is not analogous to the removal of one of a pair of kidneys or lungs where the patient can live a normal life with the remaining organ. Nor is it the same as an open-heart operation where the surgeon is merely operating on the organ, not removing it.

It may be that if consent is given for a heart transplantation both by the donor and recipient and their families, civil action would be unlikely in the event of a failure. Even if such action were brought, the virtually hopeless physical condition of each party at the time would probably make an award of damages unlikely.

However, criminal action is a real possibility where the state feels the doctor knowingly terminated a life.

What about brain transplantation? The first successful trans-

plant of a brain from one animal to another—with the brain still functioning—was reported at the American Society of Anesthesiologists a few months ago. Such an experiment shows that in the future, it may be possible to transplant human brains. This raises all sorts of questions:

- Since the electrical impulses of the brain rather than the heart beat is now becoming the criterion of death, at what point can the brain be taken for transplantation? If it is taken after the electrical activity has stopped, it is useless. If it is taken before the electrical activity has stopped, it is murder.

- Suppose the brain of one mother is transplanted into the body of another mother. Would the brain of the first mother remember the love its former owner had for her children and for her former husband? Would its present owner now be discontent in her previously familiar environment?

- What if a man such as Einstein is judged too valuable to die. Would his consent be needed to transplant his brain to another body? Whose body should be chosen? Who should decide whether a man or a woman is too valuable to die?

- What if a person who had always been a law abiding citizen received a brain transplant and then commits a crime. Would that person be responsible?

- Imagine the brain taken from one child and transplanted to another. Who then could claim the child as their own—the parents of

the recipient child or the parents of the donor child, since the brain remembers love and training?

Before lawyers and doctors can determine the answer to these questions, they would first have to determine how much the brain is influenced by the body. Does the blood stream, the blood pressure, the hormones and physical appearance of the body exert an influence on a person's behavior? If so, how much? If it is considerably influenced by the body, then the body would "own" the brain. If not, the brain would probably determine to whom the body belonged.

All the questions raised by heart

and brain transplantation are new. Even a few months ago, the idea that lawyers and courts would some day have to deal with them seemed farfetched, to say the least.

When King Solomon had to determine which of two women was the true mother of a child both claimed, he threatened to cut the child in half. The real mother, rather than having the baby injured, offered to give him up. With modern medicine's increasing ability to take the heart or the brain from one child and implant it in another, the courts, like King Solomon, may again have to decide which is the true mother.



"And what's the next step? Fresh eggs."



# Hormone breaks seed dormancy

**S**EEDS of most plants will germinate under proper conditions as soon as they mature. But in temperate climates, if they sprout in the fall, the embryos will be killed by freezing during the winter. The dormant seeds of a number of valuable forest trees will not germinate until subjected to a cold-moist period (usually early spring), assuring the seedlings a warm nursery during summer months.

The mystery of how this happens is being studied at the *State University of New York College of Forestry* in Syracuse, by two forest chemists, Ernest Sondheimer and Daniel C. Walton.

The subject has considerable interest for at least two reasons. First, the mechanism that triggers the end of dormancy is not known. Second, scientists usually find that a biological process will occur more readily as the temperature is raised, but the opposite is true in dormancy—it is broken by a lower temperature.

Working with white ash seeds, because of their large embryos, Sondheimer and Walton have been using ultra-sensitive laboratory techniques at the College of Forestry to learn if there are hormones or substances that may permit these trees to begin life in a "cli-



Dr. Ernest Sondheimer examines tiny white ash seedlings that sprouted from dormant seeds. Hormone broke dormancy.

mate-controlled" environment. Already, some interesting phenomena have turned up. If a dormant white ash embryo is treated with the plant growth hormone, gibberellic acid, it will begin to grow. Dormancy is broken without a cold-moist period. In addition, the scientists have found that another hormone, abscisin II, will prevent germination in nondormant embryos. The question to be answered now is whether or not the same hormones regulate dormancy in nature.

Sondheimer is also investigating the phenomenon of leaf-drop to see if it may be related to the mystery of dormancy. This, too, is a hormone-activated process.

Will greater understanding of hormone-growth relationships result in faster growing trees, increased seed production or higher quality seed? Sondheimer cautions

that none of these can be predicted at this time, but he believes that fundamental studies of this type will be of value to foresters of the future.—*Rod Cochran*

## Rays from "The Crab"

In the year 1054, both the Chinese and the American Indians recorded the explosion of a star. The gaseous remains of this explosion are known to modern astronomers as the Crab Nebula. Recently, space scientists at *Rice University* have detected a possible new en-

This giant balloon was launched in West Texas to watch gamma rays being emitted from the exploded star, the Crab Nebula.

ergy source being generated from the nebula. The discovery of gamma rays streaming from the exploded star came as a complete surprise to the scientists.

The rays were observed and measured with special telescopes carried aloft by giant balloons high above the West Texas plains.

Dr. Robert C. Haymes, associate professor of space science at Rice, explained that the source and intensity of the energy baffles scientists.

"Our observation has weakened the traditional theories of possible energy sources for the Crab Nebula," he said. "Indeed, it casts serious doubt on all present theories of the nature of the energy source."

Dr. Haymes noted that X rays appear to be emitted from within the Crab Nebula. He speculated that the gamma source may lie somewhere within this same region.

The only existing theory about the energy that could still be plausible is the "synchrotron" concept, which assumes that the nebula is behaving like a large atomic accelerator speeding up electrons until they emit gamma ray energy. If this is the case, however, the electrons would survive for only about a year.



# We've stopped growing taller

by Arthur J. Snider

**T**HE growth spurt in children for the last 100 years appears to be at an end. The surge has averaged an inch increase about every 33 years and has seen almost every generation taller than its elders. The only slowdown came during depressions and other crises.

But no change in height has been observed for the last two generations at the Fels Research Institute for the Study of Human Development where the growth phenomenon is being studied. The curve is flattening out.

"We seem to have reached a plateau in well-nourished boys and girls who also have had good access to medical care," says Dr. Stanley M. Garn, chairman of the department of growth and genetics, Yellow Springs, Ohio.

The upward trend in size was achieved even though children have been maturing earlier. Puberty is being reached  $2\frac{1}{2}$  to  $3\frac{1}{2}$  years earlier than a century ago.

"Those who mature earlier also stop growing earlier, but they have grown so much up to that point the result is a net gain," explains Dr. Garn.

Strictly speaking, people don't stop growing until their late 20s and even 30s.

"By the time they reach 18, more than 99 percent of growth has

been achieved," Dr. Garn points out, "but there is still about 2 centimeters of growth, on the average, to come for boys and 1.5 centimeters for girls.

"Growth continues in bone mass right up to the end of the 30s and in muscle mass through the 20s, and then both start on their way down."

Good nutrition, of course is chiefly responsible for larger size and earlier maturity. "However,



the word 'nutrition' must be interpreted in a very broad sense," Dr. Garn emphasizes. "Prenatal nutrition is part of it. Malnourished mothers with smaller adult body size are able to contribute less nutrients simply because they are smaller. Malnourished babies do not catch up in growth. You can see this often in twins. The smaller twin at birth usually remains smaller throughout life.

"Nutrition also means vitamins and adequacy of protein intake. It

also means good medical care and better public health.

"Turn back to 1900 and remember how many babies suffered diarrhea and other infections. These were growth retardants. Where you have infancy diarrhea, it is difficult to catch up on growth even with food supplementation."

Even though the future will see better nutrition and medical care, Garn does not foresee much gain for the middle class. Only the underprivileged can expect increased growth.

What is the ultimate potential for man's height?

"We won't know until we make our next break in terms of total environment," says Dr. Garn. "How much bigger we could become in a disease-free, injury-free, pollution-free, ideal environment, no one knows. Nor does anyone know what surprises the future holds."

Suppose, he adds, that 50 years from now the emancipation of wom-

en has progressed to the point where many do not wish to interrupt their career or otherwise have no desire to bear babies. Their fertilized egg would be implanted in the uterus of a professional "substitute mother" for the nine-month gestation period.

"How much bigger we might become because of what could be an improved prenatal environment is speculative," Garn says.

Does modern basketball, with its many 6-foot-8-inch and taller players, portend a trend? Dr. Garn's comment:

"The tall basketball players are recruited from all parts of the country, wherever a team can get them. They're brought to one place. I have no way of knowing how many tall people there were running around the country a couple of generations ago. Basketball has become a matter of theatrics and showmanship and not a scientific problem."

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## Who should be fat

Some people should be fat, in the belief of two scientists at Western Reserve University of Cleveland who have been gathering data for 30 years on peoples' body types.

Dr. C. Wesley Dupertuis and his wife and colleague, Helen S. Dupertuis, say females in general are "endomorphs" — that is, most of them are naturally round, soft-looking, less muscular than men.

"We don't agree with the view that slenderness is necessarily good," says Dr. Dupertuis. "For some, obesity is a natural thing. Trying to make one's self slender may be a mistake. Reducing can make one nervous, tense, irritable. It changes the whole body chemistry."

Reducing is useful for certain types, those whose fat adds a burden to a basically slender, small-boned frame. But heavier types —



"endomorphs" — generally have larger bones than the average and their large abdomens make room for their larger intestines and stomachs which require more food than the average man eats.

"A man like Falstaff probably would have been ruined, both psychologically and physically, if you tried to trim him down," says Dr. Dupertuis. "We believe people should keep the weight at which they feel and function best."

Tables showing what you should weigh according to your height, prepared by life insurance companies, are completely inadequate and unrealistic, says Dr. Dupertuis, because they don't recognize the great variety in human physiques.

fects of lowering body temperature by three degrees might be, but this small change is well within the range of fluctuations we have all experienced."

Drugs that reduce body temperature already have been developed, he adds.

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### Coffee dangers

A woman who complained of chills, lack of sleep and irritability was found by the doctor to drink 15 to 18 cups of coffee a day. In reporting on the case of "caffeinism" in the *Journal of the Amer-*

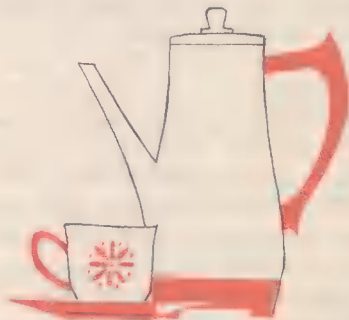
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### Low temperature — long life

Human life could be extended by 20 years if body temperature could be lowered from 98.6° to about 95.6°, contends Dr. Bernard L. Strehler, University of Southern California research biologist. Cold-blooded animals age more slowly at reduced body temperature, he points out.

"We don't know whether this rule applies to warm-blooded animals such as ourselves," Dr. Strehler says, "but if it does, the effect of reducing our temperature three degrees would add about 20 years to the average life expectancy."

"Of course one must caution that we do not know what the side ef-



*ican Medical Association*, Dr. Hobart A. Reimann of Philadelphia said a cup of coffee contains about one-tenth gram of caffeine. A single one-gram dose will cause mental confusion, shivering, vomiting and diarrhea. Ten grams can be fatal.

The patient, a waitress in a restaurant, took about 1½ grams a day. The intake was spread over several hours, probably accounting

for the fact that she was not more seriously ill.

## Weather watchers

An asthmatic's best friend is the weather report.

An allergist says there appears to

be a relationship between sudden falling temperature and asthmatic symptoms. Dr. Donald B. Frankel of the University of Illinois Medical School advises allergic patients to watch for weather predictions of a temperature drop, particularly after a warm period. If possible, exposure to the cold should be minimized.

## AMA's facts about health superstitions

Old soldiers may fade away, but not old superstitions. They're simply replaced by new ones. And according to the American Medical Association's health information manual, "Today's Health," this is especially true when it comes to superstitions and misconceptions about health. Some of the new ones they've cataloged include:

- There are those who are afraid to cook with aluminum utensils because they think aluminum will poison the food. (*It will not.*)

- Some people refuse to wear glasses or hearing aids even though they may need to badly. (*This is foolish because they're both completely accepted by society today.*)

- Fluoridating public water is opposed by many because the same chemical has also been used for poisoning rats. They overlook the difference in the matter of dosage. (*Fluoridated water is safe.*)

- The atomic bomb gets the blame

for climatic changes, whereas past generations made the same accusation against artillery fire and the use of radio and television. (*The bomb has not changed climate.*)

- Mothers worry about their children's lives if a heart murmur has ever been reported. (*Although heart murmurs should be checked by a doctor, most are harmless.*)

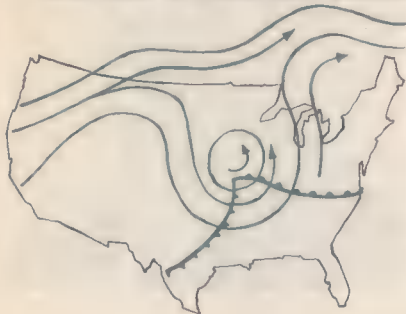
- There is active opposition to immunizing procedures such as vaccination because of a fear of introducing poison into the system. (*Vaccines in general use are safe.*)

- A modern cult of naturalism believes that only "natural foods" are wholesome because foods grown with the aid of chemical fertilizers are inadequate. (*Not true.*)

- In the same vein, many harbor prejudices against canned, frozen or otherwise processed foods and advocate eating raw food only. (*Processing does not substantially affect food, nor does proper cooking.*)

"I don't know why the sudden temperature drop seems to trigger symptoms in asthmatics", he says. "It may be a nervous system reflex or a dehumidification of tissue. It deserves further investigation."

Outbreaks of asthmatic attacks



in various countries have been accompanied by sudden temperature drops, Dr. Frankel's review of the records points out.

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## Our overworked backs

The military-style posture which emphasizes the erect chin and square shoulders pulled back could set off back trouble if civilians tried it, says Dr. Paul C. Williams, Dallas orthopedic surgeon.

Human beings have to deform the lower spine in order to stand upright. This is so because the pelvic table on which the spine rests tilts down at an average of 40 degrees. To stand erect, the spine must be severely bent backward. The bending injures back edges of the spinal disc and causes rupturing.

Rupturing may begin as early as age 6. However, since the disk contains a jelly-like substance, pain is usually minimal. It is the origin of so-called growing pains in children's backs. With advancing age, the disk loses much of its fluid content and hardens. An acute rupture can cause severe pressure on the nerves in the adjacent canal and a low back pain.

To avoid back pain, Dr. Williams offers these suggestions: Don't bend over backward for anything. Just to stand up we have already bent backward too far. Avoid exercise programs aimed at strengthening back muscles. They are already so strong from holding up the trunk they act as a bowstring for the spine. Sleep on your side and pull up your knees. This enables the lower back to round out and give the skeletal structure some needed rest.

To avoid back problems, stand tall. This is the advice of Dr. Rachel H. Woods, osteopathic pediatrician of McCall, Idaho.

If youngsters are too tired to stand or sit up straight, they should get more sleep — but they should never slouch, said Dr. Woods.

She cites a study on 1,393 Yale University freshmen in which it was found that only 25 percent had normal spinal curvature. Middle-aged or elderly persons might reasonably be expected to have posture problems, she points out, but young men just out of high school should be in their prime of health with few such troubles.

Each month Dr. Isaac Asimov chooses one of the questions you send in to answer. He does not make the job easy on himself, for in past months he has written about such things as relativity, parity and the basic nature of light. Following Dr. Asimov's answer are the answers to some of your other questions written by regular members of the Science Digest staff.

## Why Pluto is different



### How and why is Pluto different from all the other planets?

Pluto is noteworthy for being the most distant planet from the sun. (Its average distance is 3.6 billion miles). But then, some planet has to be the most distant, and it just happens to be Pluto.

Yet that is not all. Pluto has certain unusual characteristics that set it apart from the eight other major planets and make it an object of considerable curiosity to astronomers. For instance:

(1) Pluto has the most elliptical orbit of any of the major planets. A perfect circle has an eccentricity of zero and the eccentricity of earth's orbit is only 0.017. The eccentricity of Pluto's orbit, however, is 0.25. Sometimes it is as close as 2.7 billion miles to the sun; sometimes as far as 4.5 billion miles from it. In fact,

when Pluto is at its closest to the sun, it is nearer than Neptune, and, for a while, is no longer the farthest planet. Right now, it is moving in closer than Neptune, and will stay closer for about 40 years.

(2) Pluto has the most tilted orbit of any of the major planets. If all the planets were lined up in their orbits on the same side of the sun, they would all be just about one behind the other—all except Pluto. Pluto's orbit is tilted at  $17^\circ$  to ours and it could be far above the general position of the other planets or far below. (That is why it could never hit Neptune when it crossed Neptune's orbit. It would cross it far above.)

(3) The eight planets other than Pluto fall into two groups: First, there are the four planets near the sun: Mercury, Venus, Earth and Mars; all are small, dense and have



little atmosphere. Then there are the four outer planets: Jupiter, Saturn, Uranus and Neptune—giant planets, with low densities and enormous atmospheres. That leaves Pluto, which is out among the “gas giants,” yet is a small dense world like the inner planets. It is definitely out of place.

(4) If we disregard Mercury and Venus, which are so close to the sun that gravitational effects have slowed them down, we can say that all the planets rotate rapidly about their axes. The periods of rotation range from 10 to 25 hours. Yet Pluto has a rotational period of 153 hours—nearly seven days.

Why all these extremes? Is there a reason for Pluto to be so different?

One particularly interesting suggestion has been made. Suppose Pluto wasn't a planet to begin with, but was a satellite of Neptune. Suppose some cosmic catastrophe of some sort had sent it hurtling out of its satellite orbit into an independent planetary one.

If so, the nature of the explosion

(if that's what it was) could well have hurled it into a tilted and lopsided orbit; but one that brings it back toward Neptune, from where it had started out.

As a satellite, it would be small and perhaps dense, instead of being a gas giant like the true outer planets. And then, too, it would have rotated about its axis in the same time it took to revolve about Neptune, thanks to Neptune's gravitational pull. (This is true for satellites generally; it is true for our own moon). In that case, Pluto's period of rotation could easily be a week. (Our moon's period of rotation is four weeks.) Naturally, when Pluto was hurled away from Neptune, it would keep its period of rotation and would end with a most peculiar one for a planet.

Unfortunately, though, all this is just speculation. There is no hard and fast evidence that Pluto was ever a satellite of Neptune; and if it was, we don't know what kind of catastrophe could have broken it away.

—Isaac Asimov

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### **What was so strange about the giant meteor that crashed in Siberia in 1908?**

“The Great Tunguska Meteor of 1908,” or more properly, “The Great Tunguska Catastrophe,” still remains one of the most intriguing puzzles in astronomical history.

Briefly, the facts are these: On June 30, 1908, observers in Siberia saw a great fiery body in the sky.

It moved rapidly northward, and presumably crashed in a remote area. The crash produced a “pillar of fire,” followed by an enormous black cloud. Instruments all over the world measured shock waves in the atmosphere, but ground shocks were not registered anywhere outside of Russia. The next day, unusual clouds were detected in the atmosphere.

# *Are You A Slow Reader?*

A noted publisher in Chicago reports there is a simple technique of rapid reading which should enable you to increase your reading speed and yet retain much more. Most people do not realize how much they could increase their pleasure, success and income by reading faster and more accurately.

According to this publisher, most people, regardless of their present reading skill, can use this simple technique to improve their reading ability to a remarkable degree. Whether reading stories, books, technical matter, it becomes possible to read sentences at a glance and entire pages in seconds with this method.

To acquaint the readers of this newspaper with the easy-to-follow rules for developing rapid reading skill, the company has printed full details of its interesting self-training method in a new booklet, "How to Read Faster and Retain More" mailed free to anyone who requests it. No obligation. Send your name, address, and zip code to: Reading, 835 Diversey Parkway, Dept. 690-014, Chicago, Ill. 60614. A postcard will do.

Tentatively, observers decided the sequence of events had been caused by the impact of a giant meteor. But the area in which it was believed to have struck was so remote that no one bothered to try and find the point of impact until 1920, and the proper place was not located until 1927.

Whatever it was landed in the middle of a forest in a region called Tunguska. There was a large circle of burned or blown-down trees, a number of shallow holes, but no big meteor crater. Nor could careful investigation uncover traces of the meteorite itself. The more scientists investigated the Tunguska Catastrophe, the stranger it seemed, and the mystery has not been entirely solved even today.

Many theories have been advanced to explain the event.

Undoubtedly the wildest theory was advanced by Aleksandr Kazantsev, a Russian engineer and science writer. He theorized that the catastrophe had been caused by the explosion of an interstellar atomic-powered spaceship. Although he had nothing but starry-eyed speculation to back his theory, he attracted attention and support.

Right now, the most popular theory about what happened in 1908 is that Siberia was struck by a comet. Now comets, as far as we know, are made up of a body of frozen gas with dust particles imbedded in it. It seems that only collision with a comet could account for all the puzzling features of the 1908 catastrophe.



K.F.S.

## All about silver

by John and Molly Daugherty

**T**HOUGH silver is only a small part of the cost of film, without silver we'd have no photography. There is no substitute for silver, not even a theoretical one, in the photographic process. Fortunately, 85 percent or more of the silver can be recovered in the developing process.

What do you know about silver and its uses?

1. The new coinage act of 1965 authorized a change in the metal content of half dollars, quarters and dimes. These are clad or composite coins.

The clad half dollar contains

- a. A uniform 40 percent silver and 60 percent copper composition
  - b. An outer layer of 80 percent silver and 20 percent copper
  - c. A core of solid copper
2. Pure silver is harder than pure
    - a. Nickel
    - b. Copper
    - c. Gold
  3. Most silver comes
    - a. From silver ores proper
    - b. As a byproduct from base metal ores
    - c. From veins of silver in rocks
  4. Many minerals contain silver, but among these common ones, the one having the highest percentage of silver is

- a. Ruby silver (proustite)
  - b. Horn silver (cerargyrite)
  - c. Silver glance (argentite)
5. The best conductor of electricity is
- a. Silver
  - b. Gold
  - c. Copper
6. Silver, though rather widely distributed as an element in the earth's crust, is not very abundant. Comparing the abundance of iron and silver, for every 5,000,000 parts of the element iron, you find about
- a. 100 parts of silver
  - b. 10 parts of silver
  - c. 1 part of silver
7. Industrial use of silver is greatest for
- a. Electroplating
  - b. Silverware
  - c. Photographic industry
8. World production of silver varies from year to year. The greatest output comes from
- a. Europe
  - b. South America
  - c. North America
9. In the United States, silver is mined in more than a dozen states. The state consistently leading all others is
- a. Idaho
  - b. Colorado
  - c. Wyoming
10. Silverware tarnishes because of the element
- a. Oxygen
  - b. Sulfur
  - c. Nitrogen

## Answers:

**1-b** An outer layer of 80 percent silver and 20 percent copper. This is bonded to an inner core of 20 percent silver and 80 percent copper. Clad quarters and dimes contain *no* silver but have an outer layer of 75 percent copper and 25 percent nickel, bonded to a core of copper.

**2-c** Gold. Pure silver, the whitest of the metals, is harder than pure gold, but softer than copper. Nickel is harder than gold, silver and copper.

**3-b** As a byproduct from base metal ores. Often silver alloys itself with other metals like gold or lead. The ancients who found ore with 80 percent gold and 20 percent silver called the mineral electrum. About three-fourths of silver production is a byproduct from the extraction of other metals. Only about one-fourth is from silver ores proper.

**4-c** Silver glance (argentite). This silver mineral contains 87.1 percent silver. It is a sulfide of silver found in many mines in the Western World.

Horn silver, composed of silver chloride, contains 75.3 percent silver.

Ruby silver of the proustite variety is 65.4 percent silver.

**5-a** Silver. Silver is the best conductor of electricity. On a scale of conductivity with silver rating 100 percent, copper rates 96.3 percent, and gold 67.3 percent.

When copper was scarce and badly needed during World War II, the U. S. Government loaned about one billion ounces of silver to use as electrical conductors.

**6-c** One part of silver. The element silver is only about .0002 percent (two ten-thousandths percent) as abundant as the element iron.

**7-b** Silverware. Most of the silver goes into producing sterling consisting of 92.5 percent silver and 7.5 percent copper to harden the alloy. The photographic industry is second,



using compounds of silver such as silver bromide and silver iodide. Electroplating ranks third.

In one year when world production was 219.4 million ounces of silver, 63.3 million ounces went into coinage, and 152.1 million into industry and the arts. In 1966 world production was 253,000,000 ounces.

**8-c** North America. Its production of silver amounts to more than half (about 62 percent) of the world's total. South America contributes about 20 percent and Europe, 10 percent. In North America, Mexico leads with 35 percent, although she didn't develop her mines until about 1900. The U.S. is second with about 21 percent.

In South America, the Bolivian mine at Potosi has produced one billion ounces of silver since 1544.

**9-a** Idaho. The order of the states following Idaho varies. In 1965, the order was Idaho, Arizona and Utah; in 1964, Idaho, Arizona and Montana; in 1950, Idaho, Montana and Utah.

**10-b** Sulfur. The sulfur in eggs tarnishes silverware. But silver tarnishes from city air containing sulfur compounds, too. Gas and oil fuels used in homes tarnish silver. Electric heat introduces no chemical compounds of silver to the air.

### Score yourself:

- 9-10 right** You were on your metal!
- 4-8 right** Your score has a silver lining — it could be worse.
- 0-3 right** Your score's tarnished.

# Does Your Memory Fail You?

A noted publisher in Chicago reports there is a simple technique for acquiring a powerful memory which can pay you real dividends in both business and social advancement and works like magic to give you added poise, necessary self-confidence and greater popularity.

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To acquaint the readers of this publication with the easy-to-follow rules for developing skill in remembering anything you choose to remember, the publishers have printed full details of their self-training method in a new booklet, "Adventures in Memory," which will be mailed free to anyone who requests it. No obligation. Send your name, address, and zip code to: Memory Studies, 835 Diversey Parkway, Dept. 690-014, Chicago, Ill. 60614. A postcard will do.

## Are they now Identified Flying Objects?

*UFOs—Identified.* Philip J. Klass  
Random House. (\$6.95)

Technical writer Philip J. Klass has bravely taken on what will doubtless turn out to be a thankless and unrewarding task. Klass has tried to prove that many of the most puzzling of the Unidentified Flying Object sightings resulted from ball lightning and other types of ill-understood atmospheric plasmas.

The task is thankless because most of the people who are still interested in UFOs or flying saucers are going to denounce Klass for showing that their beloved "enigma" is anything less than a full-fledged invasion from outer space. It is unrewarding because reasoned scientific analyses of the problem is not what the public wants. No man as intelligent and truthful as Klass can expect to command a fat price from big national magazines for pre-publication book rights, or expect to raise his standard of living from the sale of his work to one of the major paperback publishers.

Sadly Klass will not even be able to console himself with the thought that his explanations helped kill off the nonsense about the little green men in the little round ships. True, interest in UFOs seems to be dying, or at least to be at a low point at the moment. This is not because people have become convinced that UFOs are freakish natural phenom-

ena. UFOly has always been a fad, and public support is fickle in such matters. But like the Ouija board, the saucers will probably return in a few years and Klass' excellent explanation will have been forgotten, or brushed aside by those wishing to exploit the subject.

This is really a shame, because Klass' explanations are not only clever, but probably correct in many cases. He shows dramatically that certain types of atmospheric plasmas are much more common than previously believed.

There is one thing about "UFOs Identified" with which this reviewer might quibble a bit. The author states that his plasma theory "unravels one of the most baffling scientific mysteries of the 20th century; the enigma of Unidentified Flying Objects, or UFOs."

As Klass clearly shows, plasma may well account for some sightings. But many others have already been adequately explained as misinterpretation of common phenomena, or just plain fraud. A tiny number will still remain unexplained, probably because of lack or confusion of data. There is no single UFO mystery. UFOs have been many things. The only real "mystery" is why millions jumped to the conclusion that all the things in the sky they could not identify were spaceships from "out there."—D.C.

## Other new books of interest

*The Craters of the Moon.* Patrick Moore and Peter J. Cattermole. W. W. Norton & Co. (\$5.95) Are the moon's craters volcanic, or formed by impact? Both, say these experts, but the convincing evidence they present here is designed to prove that vulcanism accounts for most of the characteristic lunar features by far.

In preparing the reader for what they want to say, however, the authors describe—in fascinating detail—all the geological (on the moon it's really selenology, they point out) features known. For the average reader, this alone is worth the price of admission. You'll go on a tour of the *maria* (seas), one of them — *Prodellorum* — covering 2,000,000 square miles. Did you know that the Leibnitz and Dörfel

Mountains compare in height with the highest Himalayas? That some peaks are much higher, with hill-top crater-lets on them? You'll prowl the rims of craters, stroll the walled plains, examine domes and rays. Diagrams and photos illustrate the points in the text.—RFD

*Great Waters.* Sir Alister Hardy. Harper & Row. (\$10.95). A fascinating volume for natural historian, oceanographer or the layman who is interested in the natural wonders of the ocean. The author was chief zoologist aboard the famous *Discovery*, which, in 1925, set out to study the Antarctic waters and all they embodied that affected the lives of the great whales living there. *Great Waters* does more than just recount those investigations. It is a study of the evolution of

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*Tracks.* E.A.R. Ennion and N. Tinbergen. Oxford University Press. (\$4.25).

It's amazing what stories animal tracks in the sand or snow can tell about natural wildlife. And here's a book devoted entirely to a study of those tracks, the animals that make them and the interesting stories they tell. It's primarily a pictorial study, of course, but the authors, both naturalists, also give plenty of advice on how to identify and interpret the tracks. The picture shows the desert toad leaving his mark in the sand.



modern oceanography, bringing up to date more recent Antarctic investigations.

*Amateur Astronomy. Patrick Moore. Norton. (\$6.95).* A man with an extensive background in astronomy offers a thorough guide to the astronomer—amateur or experienced. He discusses equipment needed for the amateur and goes into explanations of stars, the solar system, comets, etc. Maps, charts, appendices listing everything from satellite data to astronomical societies and multitudes of other things that every astronomer should know are included here.

*Mr. Tompkins in Paperback. George Gamow. Cambridge University Press. (\$4.50).* Contrary to its title, this version is a hardback and is a combination and updated version of Mr. Gamow's earlier classics, *Mr. Tompkins in Wonderland* and *Mr. Tompkins Explores the Atom*, with several new chapters. This explanation of the science of physics as seen through the eyes of a funny little man named Mr. Tompkins, both delights and teaches the novice who is trying to grasp the laws of physics.

*Mechanical Man: The Physical Basis of Intelligent Life. Dean E. Wooldridge. McGraw-Hill. (\$8.95).* To say that man is only a complex kind of machine may seem to be going a bit too far for some, but Dr. Wooldridge says just that, and backs what he says with scientific

findings. He also says that the ordinary laws of physics determine intelligence and consciousness factors, as well as physical and behavioral properties of the human organism. And because Dr. Wooldridge says the concept of man as a machine must eventually change social attitudes, he discusses such philosophical topics as free will, morality and society's treatment of the individual.

*A Walk Through the Garden of Science. Joseph Wechsberg. Weidenfeld and Nicholson.* While this gives the reader a look inside one of the world's outstanding institutions of scientific research, the Weizmann Institute of Science in Rehovoth, Israel, it also offers a perceptive look at the scientists who work and live in such a place. Although scientists sometimes seem to do their best to separate themselves from society and "nonscientists," the nonscientist who writes the book discovers that the scientists can be human too.

*The Science of Art. The Cybernetics of Creative Communication. Robert E. Mueller. John Day Co. (\$6.95).* The author, both a scientist and an artist, deals with an interesting theory here—that art actually is an antecedent to science, which requires the creative insights of art to develop its scientific theory. In the book, he studies the different arts and how, or what, they contribute to new scientific thought.



## The leak you can see

**T**HE way to detect pipeline gas leaks is to make them plain for everyone to see. In this belief, Joseph J. Packo of Fort Lauderdale, Fla., has patented a coloring process that turns escaping gas into streams of bluish white smoke (below).

The process, called Saftigas, is being offered to large pipeline companies as a cure for costly and dangerous losses of natural gas. It has also been discussed with the space and defense agencies.

Packo is organizing a company to license transmission, distribution and chemical concerns under Patent 3,361,547 and others pending. The inventor believes the process will be useful also for aircraft tanks, missile engines and cylinders in which fuels and other volatile fluids are sold.

One of the Packo associates in the project, Dr. Athelstan Spilhaus, president of the Franklin Institute, Philadelphia, commented on the value of this immediate detection for cryogenic liquid gases.

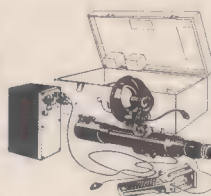
"Even a microscopic leak of such liquid gas will expand many thousands of times in a matter of seconds," he said.

Of the many tints that can be produced, Packo calls the bluish white the most distinctive. The use of metal alkyls and other chemicals, including the fluorescent, is covered

by the issued patent, and additional compositions are provided in the four pending. They can be distributed as liquids by atomizing or by the use of wicks.

A dyed gas in a pipeline can be detected through transparent windows, according to Packo. And if an infrared sensor is flown over a buried pipe carrying gas marked with a metal alkyl, leaks can be detected before they reach the surface.

The inventor believes Saftigas to be a major breakthrough, superior to odorants, which are required in most states, and other leak detection means.—*Stacy V. Jones*



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WINEMAKERS - Free catalog and recipes. Kraus, Box 451-R, Nevada, Missouri 64772.

PLEASE Be sure to include your zip code when ordering merchandise from classified advertisements. You'll receive faster delivery.



### "Witching" upheld

I am a subscriber to your magazine and have thus far enjoyed it. But I now wonder if all of your articles are obtained from people with such an apparent lack of reliable information as was in your January issue concerning water witching. From this article it seems one could safely assume that there is nothing to dowsing. I suggest the American Society of Dowsters at Danville, Vt., be contacted about this. It seems to me that any printed article should be checked out with competent personnel of a particular field before "fact" printing.

TALMADGE RUTHERFORD  
Clanton, Ala.

### A sunken continent

In the October '67 issue there is an article entitled "Isle of eyeless watchers." The author, L. Sprague de Camp, says of Easter Island, "Some have said that Rapa Nui was the remnant of a sunken Pacific continent . . ." He then goes on in the same paragraph to say that, "Geology has, however, completely discredited such ideas."

I, as a college student, am very interested in the field of study Mr.

de Camp introduces in his article—namely the archaeological discovery of a sunken Pacific continent. And because of my interest and knowledge in this subject, I would like to question the validity of the afore mentioned statement that discredits the existence of a sunken continent. From the research I have done on this, I have reason to believe that a sunken continent does exist. I suggest consultation of "The Lost Continent of Mu," "The Children of Mu" and "The Sacred Symbols of Mu," by James Churchward. Also, "The Problem of Lemuria," by Lewis Spence.

RICHARD T. LUSKIN  
Genesco, N.Y.

*Neither Churchward nor Spence are considered to be authoritative science writers. Their works have little to do with accepted geologic theory.*  
—Ed.

### Self-determination over black power

Regarding your article, "The psychology behind black power" (January '68), I am an "American Negro," which appellation I accept because it offers more latitude in the acknowledgment of my diverse origins without any stigma of shame, and it portrays my loyalty and confidence in American ideals.

I personally repudiate "Black Advocacy" because it basically lacks a breadth of vision and worthiness of definition, even should it offer some element of expediency. A vibrant culture must meet the challenges of the times or be exterminated. These are technological times with promise of new horizons. Primitive notions,

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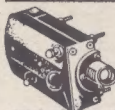
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no matter what force of jingoism comes to bear, cannot logically be foisted upon the larger society. I do regard and respect the eclectic impact of cultures, and truly consider the Negro as being in a position to offer much by way of new human insights. There is much opportunity for exchange!

Despite the numerous handicaps, ultimately nothing will be able to replace responsible self-determination.

VICTOR J. PATTERSON  
Compton, Calif.

### "Supercomputer" just for fun?

Please tell us how many indignant

letters you received about Isaac Asimov's "The thinking machine" (December '67). And did many readers compare it with the last part of the second paragraph of "A sane looks at myths" (page 79 of the same issue)?

Now I know why scientists have fun . . .

If "Supercomputer" is not a fantasy, the fun of scientists is of a grim kind! It's already hard enough to forgive our most brilliant minds for the "Ultimate Weapon."

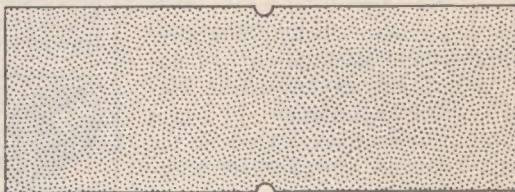
MRS. CLAUDE GAMBLE  
Orrville, Ontario

*Your indignant letter was the only one.—Ed.*

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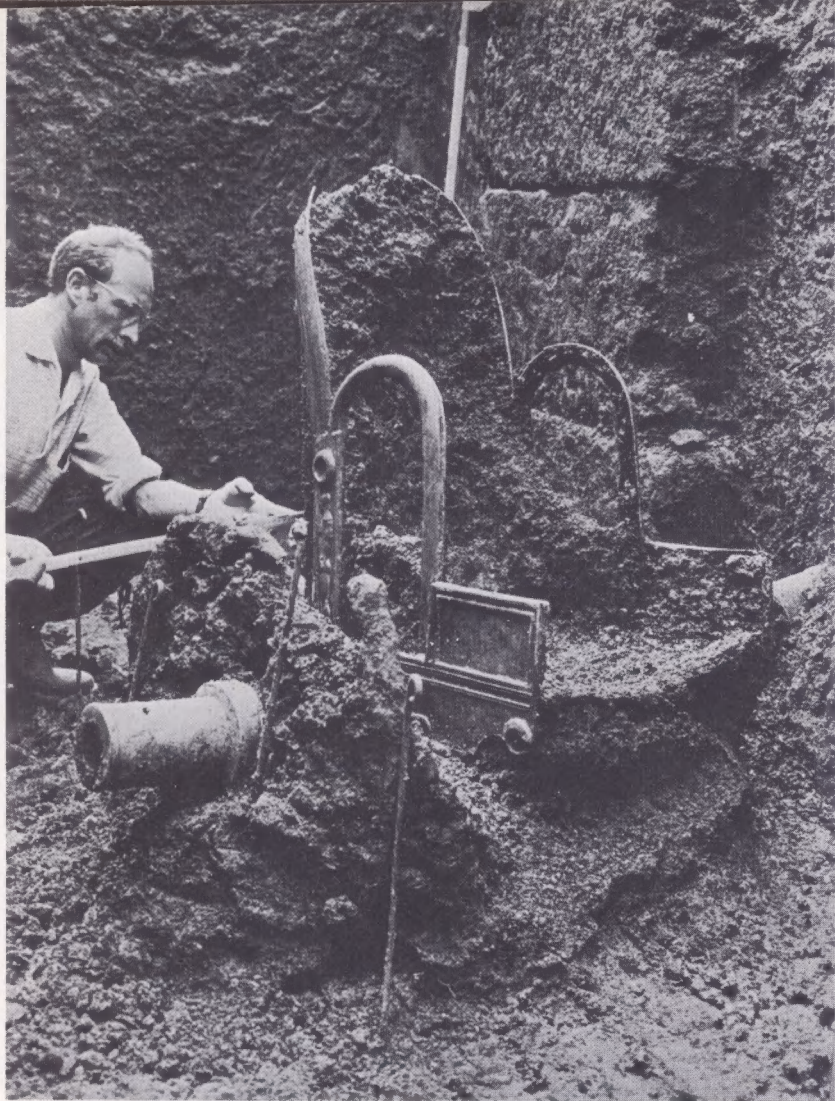
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Pictorial Parade

## A thing of the past

**E**TRUSCAN war chariots are definitely a thing of the past, but when this one showed up in the present, it caused a good deal of excitement. A Belgian archaeological team

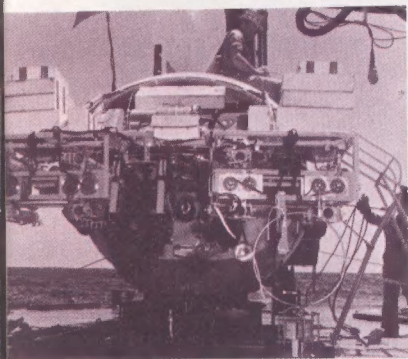
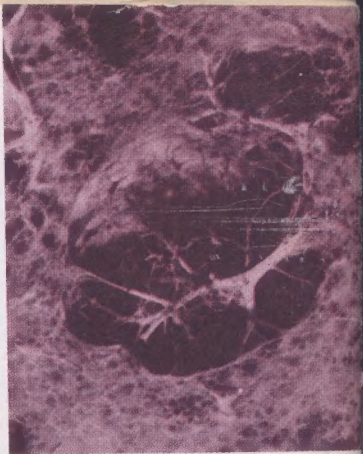
uncovered the quite rare and valuable chariot several months ago when excavating at a place called Ischia de Castro, located about 75 miles from Rome, Italy.

## In this issue . . .

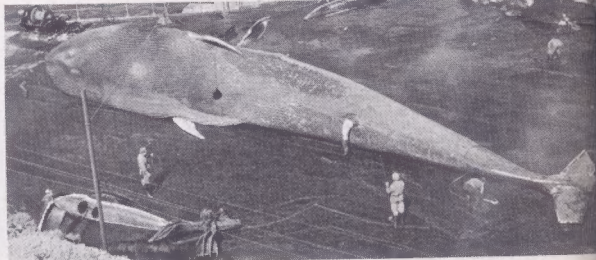


The medical complications of heart and brain transplants are well on their way to being solved. The agonizing legal and moral problems are only now beginning to present themselves. A discussion of the dilemma on page 68.

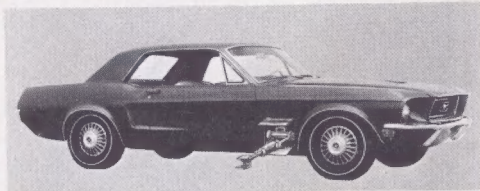
This is what the inside of a lung with emphysema looks like. It isn't very pretty. Emphysema is a serious disease, but in an article beginning on page 61, a physician contends that its dangers have been hysterically exaggerated.



Deepstar-4000 is a highly sophisticated undersea exploration vessel and businessmen should be interested in it. Industry is moving increasingly into deep sea exploration. Aided by government and university research, private companies may soon find the oceans one of the most profitable frontiers ever opened. See pages 66 and 67 for a look at industry.



Most of us think of whaling in terms of old romantic wooden ship days. It isn't at all like that now. Whaling has been mechanized into one of the cruellest, dirtiest and most stupidly short-sighted practices in the world. For the story, see page 46.



A sure cure for the reckless driver would be this extendible arm which would hook onto a power source and operate a car under computer control. It's actually being developed at Ford. See pages 32 and 33 for how it will operate.



This man is recording frogs' voices in order to make an LP record. Now who would want to buy a record like that? You might be surprised. There is a large market for animal noise records. See page 56 for details.



South of Egypt is the Sudan, known to the ancients as Kush. Most of it is so hot and dry that it seems unfit for human habitation. Yet, at one time there was an empire in Kush strong enough to conquer Egypt. From the Egyptians they learned how to build pyramids, and they built over 230, more than anyone else. Page 14.